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PROTOTYPE OIL SHALE LEASING

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FOR Pete Rutledge

HEARING

BEFORE THE

SUBCOMMITTEE ON MINERALS, MATERIALS AND FUELS

OF THE

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS

UNITED STATES SENATE

NINETY-FOURTH CONGRESS

SECOND SESSION

ON

FUTURE PROSPECTS FOR OIL SHALE DEVELOPMENT

NOVEMBER 30, 1976

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OVERSIGHT—PROTOTYPE OIL SHALE LEASING

TUESDAY, NOVEMBER 30, 1976

U.S. SENATE,
SUBCOMMITTEE ON MINERALS, MATERIALS AND FUELS,
OF THE COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C.

The subcommittee met at 10 a.m., in room 1114, Dirksen Office Building, Hon. Lee Metcalf, presiding.

Present: Senators Metcalf and Bumpers.

Also present: D. Michael Harvey, deputy chief counsel, and Norman R. Williams, professional staff member.

OPENING STATEMENT OF HON. LEE METCALF, A U.S. SENATOR FROM THE STATE OF MONTANA

Senator METCALF. The subcommittee will be in order.

There have been grave changes in the country since the last time this subcommittee met, but the purpose of this hearing is to get ready for the prospective session of Congress coming up, and to catch up with what has been done on oil shale development.

This is an oversight hearing of the Subcommittee on Minerals, Materials, and Fuels of the Senate Interior Committee. Its purpose is to examine future prospects for oil shale development in light of the recent suspension by the Department of the Interior of operations on all four of the outstanding Federal oil shale leases.

Since December of 1973, the subcommittee has maintained continual oversight of the Interior Department's prototype oil shale leasing program. We held hearings in 1973, 1974, and 1976. Since then we have had a continual exchange of correspondence with the Department of the Interior and other interested parties about the status of the program.

The Interior Department has approved applications for lease suspensions filed on March 3 by the Colorado-b lessees, and on July 2 by the Colorado-a lessees. The suspensions are for 1 year.

According to a letter we received on August 20, 1976,[1] one reason for suspension was the discovery that natural background levels of certain contaminants at the development sites exceed Federal clean air standards, thus causing doubts about the feasibility of proceeding with mining and processing.

Engineering problems related to rock strength and lack of authorization for off-tract disposal of spent shale and overburden are other reasons which the Department cited.

[1] See app. III, p. 99.

The Secretary, acting under powers vested in him by the Mineral Leasing Act, determined that suspension of the leases should be granted in the interest of conservation of natural resources. More recently, he has granted suspension of two leases for Utah tracts as well, thus bringing the active portion of the Department's oil shale prototype program to a complete halt.

His action raises serious questions about the long-range intentions of the lessees, about the prospects for survival of the Department's oil shale leasing program, and about the future of oil shale development in the national energy picture.

Since 1973, members of the Senate Interior Committee have repeatedly urged the Department to lease Federal lands for in situ development of oil shale. The two Wyoming tracts which the Department originally indicated might be developed by in situ methods contained the smallest quantity of shale of the original six tracts. They were never leased. In April 1975, the Department called for nominations for in situ leases, and I believe environmental impact statements are now in preparation.

The Department cited this proposal as the basis for its opposition to the in situ oil shale demonstration called for by section 102 of the ill-fated conference report on the December 1975 ERDA authorization bills. The conferees favored that approach because there were so many doubts about the ability of private industry to follow through to commercial development of oil shale on Federal lands under existing parameters of the Department's prototype program.

Today we wish to review these and other related matters to determine if we can, where the oil shale prototype program is heading and to learn about projects under way on private oil shale lands.

Representatives of the Department of the Interior, the Energy Research and Development Administration, the Federal lessees, and representatives of other private corporations interested in oil shale development have been asked to testify.

The first witness is Mr. Christopher G. Farrand, Deputy Assistant Secretary for Land and Water Resources, Department of the Interior. We are delighted to have you here with us this morning, you and your colleagues. You go right ahead with your perpared statement.

STATEMENT OF CHRISTOPHER G. FARRAND, DEPUTY ASSISTANT SECRETARY, LAND AND WATER RESOURCES, DEPARTMENT OF THE INTERIOR; ACCOMPANIED BY FREDERICK FERGUSON, ASSISTANT SOLICITOR

Mr. FARRAND. Thank you, Mr. Chairman. I brought with us Mr. Frederick Ferguson, our Assistant Solicitor for Minerals and, of course, you know Mr. White.

Rather than read my statement, I will summarize the pertinent points.

Senator METCALF. All statements will be put in the record if the witnesses wish to summarize, and then we can have a little more time for discussion.

Mr. FARRAND. Rather than recapitulate the history and background of the Department's prototype program, I thought I would pick up

where we left off the last time we appeared before this committee. You recall early last spring we appeared to discuss legislation authorizing offsite disposal. Since that time, and as you are well aware and mentioned in your opening remarks, we have granted requests for suspension for Colorado tract C–a and C–b as of July, and more recently than that, we have granted suspensions for the Utah A and B.

Also, since that time, and perhaps equally significant, Colorado tract C–b, one of the lessees, Shell Oil Co., withdrew from the lease and the other remaining partner, Ashland, subsequently announced that it had joined in partnership with the Occidental Petroleum Co., in which Occidental would become the operator with a 50-percent equity in the lease.

The net effect of these actions, while they may appear to be negative, we believe to be positive.

In the course of the past few months we have learned what our immediate problems are with the environment and with certain background conditions. However, we feel confident because the new lessees, despite there obsticles, are ones who have continuously professed the greatest interest and enthusiasm for actually developing commercial oil shale deposits.

Moreover, we now have focused our attention on trying to solve these remaining impediments to oil shale development.

With respect to the reasons for suspension itself, there is one overlying reason that affected all four of the suspended leases. We learned in the baseline data program, which we required of the lessees, that in three specific categories the background air quality, ambient air quality in the Piceance Basin and those portions of Utah where our leases exist, exceeded the ambient air quality standards: particulates, hydrocarbons and ozones. This presents a rather unusual problem since there are no major point sources in that area. We suspect then that this is caused either by fugitive materials from other air quality basins, perhaps the Salt Lake City area, or, more likely, by natural emissions from natural sources within the Peons Creek Basin itself. In the latter case, Mother Nature would be the dirty bird.

There is a legal prohibition on lessees not to act under those conditions until it can either be proved that these incidents in which the air quality pollution exceeds the standards no longer exist or until the standards themselves are changed.

When we discovered this to be a problem we immediately contacted the Environmental Protection Agency, asked them whether in fact the situation had to be resolved legislatively or whether it could be resolved administratively. The answer the Secretary received from Administrator Train was that they believed that in July an amendment then pending before the Congress would solve the problem, but barring that they thought they could deal with it administratively and were in fact undertaking some studies to determine whether a change in the standards or a change in the approach to the ambient air quality problems might be appropriate.

I have received a draft, internal copy, of their study, which indicates that when they set the ambient air quality standards they did not understand all the interrelationships between hydrocarbons on oxides, and in fact they may have to adjust the geographical boundaries for which they set ambient air quality standards.

If they do, it might resolve the problem. Without administration or legislative help, however, I remind you that the situation presents an absolute impediment; that there can be no legal action to develop those leases under the conditions that appear to exist at this point.

Apart from that circumstance, on Colorado tract C–a there is another reason for suspension. The lessees of Colorado tract C–a submitted a detailed development plan last spring which envisioned surface mining operations. As we discussed when we appeared before the committee earlier, they had requested authority to dispose of spent shale and overburden offsite for reasons that would enhance the recoverability of the resource on that tract.

The Department supported that request, and actually sought legislation, as you well know, because there is a sizable difference in the recoverability between open pit, which would necessitate offsite disposal, and an underground operation, which would not necessitate offsite disposal, we believed this was an auxiliary reason for granting suspension; that is, having the issue resolved one way or another in the legislative process. Either the Congress would grant the authority or would not, whereupon we would give the leasers a reasonable time to try to resolve that problem.

With respect to Colorado tract C–b, there was an additional reason for suspension. They determined in their detailed development plan preparation that the rock strength in that tract was not as great as they had originally anticipated. Hence the mining design which they had conceived was perhaps no longer valid and that further studies were going to be necessary. The result of less rock strength is the necessity of significantly larger pillars in an underground room and pillar operation. This represents a significant, not prohibitive, but significant loss of resource, of recoverable resource. We felt that this also was an auxiliary reason for suspension under section 39 of the Mineral Leasing Act. Section 39 allows us to suspend for reasons of conservation or resources. There is some question, I think, as to whether that means the mineral resource only or other resources. We believe, however, that in a recent court case, *Gulf Oil* v. *Morton*, this issue was resolved. *Gulf Oil* v. *Morton* had to do with a provision in the Outer Continental Land Shales Act which we understand is based on section 39 of the Mineral Leasing Act, which allows us to suspend for reasons of conservation of resource. We applied it to an obvious pollution problem of the coast of southern California, and the court upheld us in that determination. So on that basis we feel that we have authority under section 39 to proceed with a suspension order covering not just conservation of the mineral resource but other resources as well, in this case the air quality.

I would like to make a couple of more comments, if you will, about other impediments that we see with respect to development of oil shale.

Besides the air quality problem and the offsite legislation problem that I mentioned, we have had a problem in the past with another proposal by the Superior Oil Co., in which they anticipate a multimineral development process for oil shale, oil shale that in their particular tract is mixed with two other commercially producible substances: Nacholite, a form of sodium bicarbonate, and Dawsonite, a form of alumina.

The Superior process anticipates being able to develop in unison this Nacholite, an important ingredient for stack gas scrubbers for coal plants, and Alumina, which in their process comes out as a clear crystal and which is source of aluminum and would be the only commercially produced aluminum in the United States. However, their particular tract is strung out in such a fashion that it will become uneconomical to mine, and they have requested the Department for an exchange so they could "block" up, if you will, their holding into a logical unit and make it economically viable.

We have begun to develop an environmental impact statement which would allow us to make that exchange and we are hopeful that their process, along with others, will give us a greater knowledge about the commercial viability of oil shale production.

Another impediment to the development of our existing prototype leases has had to do with the availability of town sites and rights-of-way. This impediment, however, we believe has been meliorated somewhat by the passage of the BLM Organic Act, which allows us to proceed with such exchanges, which we are prepared to do.

Finally, and this is somewhat of a personal comment, the advent of the Synfuels bill in the last Congress has, from the rather narrow standpoint of the prototype program, been something of an impediment. I say this because once the prospect of significant economical incentive and support was held out to these lessees, they were not about to make a move on their own. No financial committee of any major corporation could rationally be expected to make a multimillion dollar commitment in the neighborhood of perhaps $800 million for these tracts if there was a prospect, even a remote prospect, that they would get a portion of, or a substantial portion of that funding through loan guarantees or other subsidies. So until that question is resolved, my personal guess is that it will be very difficult to extract a major financial commitment from these firms.

In that sense, again as a personal comment, I would urge that the Congress in the next session dispose of this issue, but deal with it early so that it no longer becomes an impediment to the decision-making process that these lessees have to make with respect to those tracts.

Finally, a couple of comments about oil shale, and I know Dr. White will expand upon them later. We believe that of all the synthetic fuels, oil shale is closer to commercial production than any other. Moreover, we see it as an aid to our energy picture in two respects:

First, because of the size of the resource, you may recall, we discussed there are 600 million barrels of recoverable shale oil in the three States, Colorado, Wyoming, and Utah, that if we were able to prove that one or more of these tracts could be commercially viable at a competitive price on the world market, that the commercial viability of oil shale may become a psychological lever, if you will, a ceiling against increases in the world oil price. Obviously, it wouldn't become an absolute ceiling until you produced shale oil in sufficient quantities, but as a psychological lever we think it would become effective sooner than would otherwise be the case with mass development.

Finally, shale oil at this point represents the only reasonably feasible liquid alternative in the synthetic fuels area. Regardless of what happens with coal gasification or other gaseous synthetic fuels there will be a segment of our energy demand, primarily the transportation sector, which will require liquid fuels and shale oil can help us fulfill that.

That is a general summary of my comments, Mr. Chairman. I would be happy to try to answer any questions that you have.

[The prepared statement of Mr. Farrand follows:]

STATEMENT OF CHRIS FARRAND, DEPUTY ASSISTANT SECRETARY, LAND AND WATER RESOURCES, DEPARTMENT OF THE INTERIOR

It is again my pleasure to appear before this Subcommittee to discuss oil shale. There is perhaps no program within Interior that has been so often discussed and so frequently misunderstood as the Department's Prototype Oil Shale Program.

I will not belabor you with a recapitulation of the history and background of the program. The Subcommittee is no doubt aware that in July the Department granted requests for suspension of Colorado tracts C–a and C–b for a period of one year. Earlier this month Shell Oil announced that it was withdrawing from the C–b project. Several days later Ashland Oil, the surviving member of the original successful bidders, announced that it had reached an agreement with Occidental Petroleum which will become a 50 percent partner in the C–b project and act as lease operator.

Also, earlier this month, the Area Oil Shale Supervisor issued a Notice of Suspension for oil shale tracts U–a and U–b. This action came as a result of a new application for suspension submitted by the Utah lessees, which raised essentially the same air quality issues which the other lessees identified. Like the Colorado suspensions, the Utah notice suspends the leases for a period of one year conditioned upon the maintenance of certain monitoring programs and the continuation of certain studies.

If I were to characterize the effect of these recent actions, I would say the end result is more positive than negative. It is true that, while under suspension, nothing can go forward with respect to actual development of the leases. However, the baseline data efforts conducted by the lessees, and the preparation of DDP's has identified some specific problem areas which we are now trying to resolve. At the same time, the withdrawal of Shell Oil Company from tract C–b and its subsequent replacement by Occidental has put suitable oil shale resources in the hands of those who have continually expressed the most enthusiasm about commercial development. Moreover, the change to modified in situ processes could help "prove up" a technology which many believe may eventually be the most environmentally and economically sound.

Another positive event is the development of multi-mineral recovery processes for oil shale. Superior Oil Company, for example, has developed a process which uses shales containing high concentrations of dawsonite. This process is said to yield alumina, shale oil, as well as, various sodium compounds of which are useful in removal of SO_2 from stack gases. The Department is currently processing a land exchange application by Superior which would permit development of this multi-mineral recovery process.

The net effect is positive—but significant impediments to the program remain.

I would like to discuss for a moment some of the major obstacles preventing development of the prototype leases:

Air Quality.—Baseline data from the four leases indicates that the national primary and secondary air quality standards are on occasion exceeded on the undeveloped tracts. This has been discussed with EPA which is currently studying a means for defining geographical areas for oxidant control strategy. We hope that this problem can be resolved administratively.

Offsite legislation.—At the time the leases were issued, Interior believed it had authority to permit use of off-lease areas for tract development. A subsequent legal opinion reversed this position. To provide this authority, legislation was introduced into the 94th Congress (S. 2413) but was not acted upon. Compared to surface mining of C–a it is estimated that ¾ of the resource would be lost if a combination of surface and underground mining were used. This difference would be reduced if a modified in situ approach were adopted by the C–a lessees.

Exchange.—Land exchanges will facilitate shale oil development. One of these is a proposed exchange with the town of Rangely, Colorado, to allow community development. Interior received authority to consummate the exchange with the passage of P.L. 94–579. The Department is also processing a land exchange application by the Superior Oil Company which would permit development by a multi-mineral recovery process.

Synfuels commercialization.—The recent debate on H.R. 12112 has had both a negative and positive impact on tract development. Some lessees supported the bill feeling that a Federal subsidy would reduce the financial risks of development. Others have opposed the bill because some companies might receive Federal financial incentives to develop oil shale which is what the current lessees have already paid to do.

We believe these issues must be resolved before any commercial development can be expected on the oil shale tracts.

Aside from the legislative and environmental problems, economic questions remain. Will oil shale be competitive with imported crude oil or other sources of synthetic liquids? There can be no answer to this question until a commercial scale oil shale plant is built and actual costs demonstrated. Estimates of the cost to produce shale oil vary with the technological, financial, and resource assumptions made. Based on recent studies by the lessees and contract studies done for the Department, it has been estimated that the use of modified in situ technology would result in lower costs and in recoverability which would be more than room and pillar technology though less than open pit. Costs of less than $6 to over $13 per barrel are theoretically possible with proper selection of input variables. Using more conventional mining technology with surface retorting costs ranges from $15 to over $20 per barrel are estimated. These figures can be substantially reduced using combined technologies. If these cost estimates are correct, and considering the expected price of OPEC oil in the early 1980's will likely be in the $15 to $17 per barrel range, we believe oil shale will become economically competitive with the world market crude oil by the time these leases could begin producing.

After that brief overview, I would like to return to the subject of lease suspension and the factors which led to our decision. Let me emphasize that the leases were not and cannot be suspended for economic reasons but rather because of the air quality nonattainment problem and the resource recovery issue resulting from the lack of any offsite use authority. There may be some who view the lease suspensions as a "subsidy" to the oil industry. The fact remains that there were legitimate "conservation of resources" problems for which the Secretary has the authority to suspend. The ambient air quality problem is an absolute road block. Legally, there can be no permit approvals, no development, so long as those standards are exceeded. Since there was no immediate resolution of the problem, and since the problem was not apparent at the time the leases were issued, we believe it was both prudent from a resource standpoint and equitable from a legal standpoint to suspend.

Let me speak for a moment about the economic climate in the oil shale industry. We cannot say with certainty what effect crude oil price controls, concern about divestiture or amendments to the Clean Air Act may have on investment decisions, we can only surmise what any prudent investor would do in this kind of situation. If, however, we were to resolve the air quality issue, and if offsite legislation were to be enacted, we would then be in a position to test the economic viability of oil shale. That is, after all, the purpose of the prototype program. One point must be recognized, the problems resulting in the Department's suspension of the leases will apply to any attempt to commercially develop oil shale in the Piceance Basin including development by a Federal Oil Shale Corporation.

The fact remains that shale oil technology is closer to commercial viability than any other liquid fuel alternative except crude oil. In addition, oil shale is economically as well as environmentally less costly than any of the other synthetic liquid fuel options.

Finally, we must understand and recognize the potential benefits of a commerical oil shale technology.

The most important benefit which can be derived from demonstration of viable oil shale technology is the effect such an industry could have on our payments for foreign oil. With sufficient production, oil shale could establish an upper limit for oil prices or at least create a downward pressure on future price increases above this level. Oil consumption is up over 7 percent from last year. Over 40 percent of U.S. oil is now imported and an alarming percentage

comes from Middle East OPEC countries. Continued increases in world oil prices will have an inflationary effect on our economy and cut real economic growth. Since the resources of oil shale are so large, demonstration of a viable commercial oil shale technology could provide psychological leverage in U.S. efforts to restrain future crude oil price hikes.

Senator METCALF. Thank you very much.

Mr. White, do you have a comment here.

Mr. WHITE. I have a prepared statement.

Senator METCALF. I will ask Mr. Farrand a couple of questions and then we will come back to you.

I have two comments. We did invite Superior Oil to come here this morning and testify. For some reason Superior Oil decided not to testify. I hope that when we formally open the new Congress and go forward with some of the legislation that you have mentioned, we will be able to get them here and they can tell us what they can tell us about their process and some of their plans and programs, if they can reveal it without revealing confidential information.

The second comment is that Congress has acted on the subsidy program by refusing to pass the legislation at the last Congress. I know you stressed the loan program and so forth was your personal view. I would hope that you would have somebody down at Interior send us some proposed legislation and I will guarantee that this subcommittee will give it prompt and complete consideration as soon as possible.

Mr. FARRAND. I think Dr. White will address that. I think probably the source would be ERDA.

Senator METCALF. I know you said this, but I want to underscore the fact that you have outlined various impediments and obstacles to going forward with the oil shale and oil leasing and so forth, but the only reason for cancellation or suspension of the lease is violation of the proposed air quality standards that would be violated under the EPA, is that right?

Mr. FARRAND. Well, it was the only reason that applied to all four leases, sir. We did have other reasons as well.

Senator METCALF. But the other reasons would not in themselves, without the air quality standards, justify the suspension of the leases?

Mr. FARRAND. In the case of C–a, we believe it could be.

Senator METCALF. That is the case where you cited the court decision?

Mr. FARRAND. No. C–a as an underground operation would produce about one-fourth what it could produce as an open pit operation.

Senator METCALF. And conservation of the resource.

Mr. FARRAND. Conservation of the resource. It is a staggering figure that you can produce better than 5 billion barrels of oil if you went open pit and you could produce somewhat less than 2 if you went underground with the conventional method. The difference, we believe, is a valid use of the resource argument.

Senator METCALF. You closed on a rather optimistic note that you felt that this was one of the most viable and one of the most feasible methods of extraction of liquid fuel. Just where do we stand right now insofar as the air quality standards are concerned?

Mr. FARRAND. Well, in the absence of amendments to the Clean Air Act in the next Congress which would address this so-called non-

attainment problem, it is still possible, and in fact this is further along than when we originally posed the problem, that EPA could in fact administratively change the geographic boundaries of those ambient air quality standards.

What they have determined in their study, which I must point out is a staff study, is that there are conditions in many parts of rural America that were not anticipated at the time they set the National Ambient Air Quality Standards in which those standards are exceeded but it is not necessarily harmful.

What you are dealing with, and this is probably more scientific than you and I would have any interest in getting involved in, the interaction of ingredients that produces the adverse conditions here is different in rural conditions than it is in urban conditions. The mix is different and you get less creation, if you will, of the more deleterious substances; and, additionally, the standards may in and of themselves be unreasonable in certain localities. If they make a determination that the standards are unreasonable and change them for that specific area, then that reason for suspension may no longer be valid.

Senator METCALF. When do we anticipate a decision on that?

Mr. FARRAND. I can't tell you, except to say I have been in reasonably continuous contact with EPA and they say they are working on it.

Senator METCALF. The Senator from Arkansas.

Senator BUMPERS. No questions.

Senator METCALF. We are delighted to have the Senator from Arkansas here. He has had a long interest in all the energy problems. We are going to, I believe, start out where we left off last session with grave matters of where are we going to get energy. I was pleased that you did close on a not that we have here a resource that is within the possibility of attainment.

Mr. FARRAND. If I could just take 1 more minute of time, to express again the reason why we feel that oil shale is still a very positive alternative is that the economic factors for oil shale development are not that bad. When you consider the estimated production costs for oil shale at this point, and when you consider, albeit in the blue sky fashion, that the world market price of oil is likely to continue to go, we believe that by the time these leases could reasonably be in production the oil from that shale would be competitive. Certainly far more competitive than most of the other synfuels at this point. All of the studies, both the studies that independent agencies have undertaken, ones that Interior and the industry have undertaken, have led to that same conclusion.

While there are a great many variances with respect to techniques and conditions and mining circumstances, that on the average oil shale is not out of the realm of possibility with respect to the world market price of crude oil.

Senator METCALF. Of course, one of the costs is air and water pollution and that is a cost that I think the Congress is very vehemently insisting cannot be borne by the American people. So the air and water pollution has to be eliminated before or reduced to levels that are satisfactory before we can go forward with further development.

Mr. FARRAND. In that sense I think you could say that the prototype program has already been a measure of success since we have already learned that there is an air quality problem that has to be dealt with before that resource can be reasonably extracted and that off-site disposal is needed for an open pit operation. We have also learned, as in the case of C–b, now, that the best way to go may be in a modified in situ program and I think you will hear from some other witnesses on that. There are many who believe that modified in situ or situ itself may be the most economically sound approach, and that is the approach that the lessees of C–b have indicated they are going to go We anticipate that during this period of suspension they will submit to us a modified detailed development plan which would convert the operation to a modified in situ; we have, also, had indications from the lessees of C–a that they are studying the possibly of modified in situ for that tract.

So there are some things, a great number of things that we have learned already, and we just hope that the program can continue until we learn more. The alternative, I suppose, if the leases were to be cashed in, would be to start all over again with a new Environmental Impact Statement, a new development plan for the leases, and a new sale. The result would be the loss of very valuable time.

We have good quality oil shale resources in the hands of people who still profess a great deal of interest in developing them. What remains are these few impediments and we hope to be able to deal with those one by one and move ahead with the program as originally conceived.

Senator BUMPERS. Mr. Chairman.

Senator METCALF. Senator Bumpers.

Senator BUMPERS. Mr. Farrand, what is the status of Occidental Products? They don't have a lease.

Mr. FARRAND. No, they have a lease now, sir, as a result of Shell's withdrawal from tract C–b. C–b was a lease that was owned 50 percent each by Shell and Ashland and Shell about a month ago withdrew and two days later Ashland announced that it had joined in partnership with Occidental in which Occidental would become the operating partner with a 50 percent equity. So they have the oil shale now and it is suitable for in situ development and they maintain they have a process and they are developing a modified detailed development plan now to submit to us.

Senator BUMPERS. Don't they have an operation going on some of their own lands?

Mr. FARRAND. They do.

Senator BUMPERS. How are they getting along?

Mr. FARRAND. They maintain they have a viable process. There is a research effort at this point. What they now have and what they have been requesting of us for sometime in the form of a new in situ sale, which we are still preparing to make late next year, what they have asked for is a commercial resource where they could test the test research, if you will, and they now have it.

Senator BUMPERS. How much oil are they producing with the project they have in operation?

Mr. FARRAND. I can't answer that.

Senator BUMPERS. This is a pure in situ process?

Mr. FARRAND. I understand it is. What they anticipate for their C–b tract now is a modified in situ which is a room and pillar operation with in situ for those resources in between. I understand they are going to testify later today.

Senator BUMPERS. I will save my questions for them.

Senator METCALF. Very well.

Now we have Dr. Philip C. White, Assistant Administrator for Fossil Energy, Energy Research and Development Administration. We are pleased to have you here this morning, Dr. White. We are grateful for your presence.

STATEMENT OF DR. PHILIP C. WHITE, ASSISTANT ADMINISTRATOR FOR FOSSIL ENERGY, ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

Dr. WHITE. Thank you, Mr. Chairman, Senator Bumpers.

On my far left is Mr. Huge Guthrie, director of the division of oil, gas and shale technology. Next to me is Mr. Ed Meyerson, director of the division of commercial application, and formerly with our office of commercialization before that was dissolved a few weeks back.

To simply excerpt some comments and highlights from my prepared testimony which I ask to be put in the record, I would like to start by agreeing with Mr. Farrand about the prospects for shale. We at ERDA are also very optimistic about it for two reasons that he mentioned, the economics which I will get into in more detail—and, of course, it does represent a very important source of liquid synthetic fuel. The only other prospect we have for this is coal, and for liquid fuel that would supply the transportation sector of the economy, I think liquids from coal are considerably further away in time of development and the prospects today look like they will be more expensive than oil.

The picture in shale today, however, is quite confusing. A number of problems have been outlined by Mr. Farrand, but I might mention a few others. There are both negative and positive aspects to this picture. These are the positive factors. The technology to mine the shale is in good shape, and the surface retorting is developed at the pilot plant level. There are several processes that have been tested for some time and that are considered to be ready for demonstration at a commercial or near commercial scale.

It is very obvious that when you are producing liquid fuel, if you are working with oil shale it is a simpler process basically than if you are working with coal. And the size of the resource, as we know, is enough to be very attractive and very important to the country for a long time to come. The liquids that we produce from shale fit the so-called middle distillate part of the conventional oil products that are important, of course, to the mass transportation industry. In contrast, of course, coal tends to be more in the fuel oil or heavy oil, with some production of the lighter material in the gasoline range, but very little in the middle range.

On the other hand, there are negative problems. The environment has been very well covered by Mr. Ferrand, but there are some others that I think are important to keep in mind. Inflation in the last several

years, of course, has hit the prospects for oil shale just like it has so many other parts of the economy and the synfuels industry.

I mentioned that the technologies for the retorting have been done at the pilot plant level, but it does have to be recognized that these have not been demonstrated either here or abroad on a sufficient scale so that a private company could with real confidence go into the design and construction of a full scale surface retort or an underground retort of the type Occidental has. That has been a modest sort of experimental scale so far.

It is also true, of course, that the market for the liquid products over the life of a plant is a matter of some uncertainty because, of course, the OPEC countries have the power to drop the price of imported oil and this could seriously affect the profitability of a commercial venture. Finally, again I agree with Mr. Farrand, the history of the synfuels legislation has left an uncertainty over the whole picture that has thus far, I think, a negative aspect.

We see in ERDA that of the in situ retorting processes, there is no question in my mind that the Occidental process is the most far advanced. The possibility of combining a modified in situ with complementary above ground module represents a very significant opportunity and one I think we should look at very closely. I think it is also noteworthy that Brazil is planning a commercial scale aboveground retort operation down there. We have had representatives advising that. Dr. Seamans was down there earlier this fall. They have a 500-ton-a-day retort which has worked very successfully in a system much like the Paraho retort which is a fairly well established procedure and they are planning on that basis to go ahead on a full commercial scale.

We are doing quite a bit in ERDA's program on developing oil shale technology, particularly in situ technology. We worked quite hard on the so-called true situation where there is no mining done at all, and had a modicum of success here. It was not sufficiently encouraging to make us want to go all out for that as opposed to going where some mining is done and getting the remaining shale out of the bed. In order to try to develop this we have recently gone out with a program opportunity notice for different types of in situ technologies to be tried on a small scale. We received some nine proposals from organizations and in the prepared statement I have shown the four of these that are currently under negotiation.

There is another shale resource that I don't think we should lose sight of. The so-called Devonian shales and Antrim shales in the East, which we know less about, are a large resource of hydrocarbon. They are not, apparently, retortable in terms of producing liquids, but they do contain gas and they have a high hydrocarbon type of material, particularly the ones in Michigan which apparently can be gasified in place. The process doesn't come up with natural gas but with a so-called producer gas or low Btu gas. There are a number of environmental issues other than the ones Mr. Farrand mentioned that I think are going to be problems for us where we need further information, and this is something that is going to come out of the further development program. The matter of water that is in place in an in situ mine to begin with. What is produced during the combustion and

where that goes, and then, of course, the matter of how the character of that underground shale is changed due to the reporting which may make it more leachable by water percolating through it, and a possible impact on groundwaters. The work that we contemplate under the various current projects are going to address those problems.

We have, of course, the usual amount of support research in the program in terms of shale characterization and we fund studies on small scale try to look to second or third generation approaches for shale retorting.

On economics we have some figures in the prepared testimony that I think might be worth just quoting a few of them because they certainly reflect the kind of optimism that Mr. Farrand mentioned. If one does conventional mining, and these are based on, I might say, current dollars and large commercial plants, who think they are optimistic, they are giving every break to the process that we think might eventually come with a lot of learning. These were taken out of some of the figures in the synthetic fuels commercialization program report; the surface retorting is probably a little beyond the current level of oil prices producing liquids at the range of $16 to $25 per barrel, but the multimineral process of Superior might well be below this, depending a lot, of course on the credits given for the other materials, but coming down to below $12 per barrel, and the modified in situ ranging from $8 to $11 a barrel which, of course, would be competitive right today. This doesn't say these are the costs, but if you assume everything worked just the way it should, and the environmental protection costs aren't too great, it is conceivable that it could be this low. This accounts for the significant interest being shown by Occidental and the other holders of the leases.

We think, however, some action is needed in spite of this optimistic figure, that there are the environmental problems to be resolved, and more importantly we feel there is some form of demonstration required to show that you can build one of these large retors, or perhaps, a combination of the retort and modified in situ, and I think here it is very important to recognize how neatly this might fit.

A modified in situ process requires taking out about 15 to 20 percent of the shale at the bottom of the chamber to have room to work. If one is operating at a commercial level that is aimed at 50,000 barrels per day of shale oil production, which is the size considered to be commercial, this implies a retorting level of 10,000 barrels per day, being the 20 percent size. Ten thousand barrels per day is the size of the demonstration retort we have been talking about in a number of these hearings before this committee and others, as a place to begin, that is a single retor of a size that could be designed today and it might actually fit commercially as an adjunct to a modified in situ.

I think this is the sort of approach that may be very worthwhile taking in the near future as far as demonstrating the modified in situ and the retorting step at the same time.

In conclusion, I say that we feel that shale oil production is closer to commercial acceptance than other liquid fuels or synfuel alternatives, particularly coal. We think it is basically simpler than coal. Costs are estimated to be less than the coal liquid.

The environmental impacts of a large oil shale plant are likely to be similar, certainly the socioeconomic impacts would be similar to the coal plant. However, there are likely to be less solids admitted into the atmposhere, and in terms of water requirements it appears that the modified in situ oil shale plant would take less than a coal plant.

The kind of problems, leasing and so forth, that are before us have been outlined by Mr. Farrand and I think we certainly agree with these.

I think there are problems here to be resolved but it is our intent that we should come into the Congress with a proposal to proceed with some form of retorting, perhaps coupled with a modified in situ, and seek ways of funding for that in the next session of Congress. Just exactly what form that should take and exactly what form of incentives, is something still being discussed in ERDA. This question does need to be settled.

Speaking in a personal opinion, it is my view that we should clearly go ahead and demonstrate at least one installation, get our feet wet, find what it means to build one of these. Not that we should put the Government into a commercial business or continue to underwrite this, but I think if we go ahead and demonstrate it once and get some of the answers on the environmental problems and on the basic costs, that we have a very good prospect then that further commercialization will be handled by the private sector with no further Government action.

I think that concludes the summarizing remarks I wish to make, and I would be happy to answer any questions.

[The prepared statement of Dr. White follows:]

STATEMENT

OF

Dr. Philip C. White
Assistant Administrator
for Fossil Energy

Energy Research and Development Administration

Before

the

Subcommittee on Minerals, Materials and Fuels
Committee on Interior and Insular Affairs
United States Senate

November 30, 1976

Good morning, Mr. Chairman, and members of the subcommittee. I am pleased to appear before you this morning to discuss ERDA's Research and Development program in oil shale.

Oil shale is of a vital interest to ERDA and the nation since the demand for oil and gas, even under the most optimistic energy-conservation assumptions, will eventually outstrip supply from conventional domestic oil and gas sources. The Nation's choices are to develop alternative energy sources such as shale oil or to dramatically increase our reliance on insecure imported oil and gas.

Unquestionably, converting oil shale to synthetic fuels is one of the most viable alternatives to meeting this country's future energy needs. The overall objective of ERDA's Oil Shale and Supporting Research Program is to develop and demonstrate technologies to recover energy from oil shale that are economical, safe to operate and environmentally acceptable.

However, there is a very confusing picture in the shale oil industry today.

Background

Shale-oil development, as of late 1976, displays a broad contrast between positive and negative developmental factors. The positive factors present an optimistic view as to when shale oil will begin to make its presence felt in the commercial market. These views are offset by

certain negative factors and have created a delicate balance resulting in a widespread, "wait and see" attitude with little constructive advancement toward industrial development.

Some of the positive aspects of the oil shale picture include the following:

- o The technology necessary to mine oil shale is adequate for initial commercial use.
- o Several surface processing technologies are in various stages of development and show promise of being at least marginally competitive at present.
- o Production of liquid fuels from oil shale is technically simpler than from coal and consequently cheaper.
- o Oil shale ranks second only to coal in the size of the resource; and it is essential that synfuel from both be developed. Although products from coal and shale synfuels will have certain common uses, there are important differences.
- o Coal-derived syncrudes produce a high yield of gasoline and fuel oil; shale oil derived syncrudes yield a high percentage of middle distillate oils upon which the Nation's mass-transportation industry depends.

Balancing against these positive attributes is a short but formidable list of negative aspects:

- Inflation has boosted costs almost beyond the reach of normal industrial funding capacities, particularly as regards a new, high risk venture. 1/
- Environmental restrictions have been a primary factor in suspension of activity on DOI's Colorado and Utah leases and represent a major problem in the development of an oil shale industry.
- None of the technologies associated with shale oil production, even though well advanced, have been demonstrated on a large enough scale for confidence in the prediction of the economics and materials-handling data necessary for a full-scale commercial venture.
- The future price for shale oil over the economic life of the plant is uncertain.
- Lack of approval of enabling legislation for synfuels development.

Those positive and negative factors have diminished efforts in commercialization of surface retorting technology. In situ production methods are attracting industry and Government interest. The most advanced process for in situ oil shale retorting is Occidental Oil's modified in situ process, and the company is now a partner in the Colorado C-b lease. The possibility

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1/ Estimates for a 50,000 barrel per day oil shale plant have escalated from $400 million to $1.2 billion in the last three years.

of combining modified in situ retorting with complementary aboveground processing modules presents an opportunity to greatly advance the development of several processes. Brazil is planning construction of a commercial facility based on U.S. technology which should allow some excellent economic data to be developed.

ERDA is pursuing several alternative approaches to ensure that adequate technologies will be available for retorting the wide variety of shales that are available. These different approaches are shown in Tables 1 and 2.

Oil Shale Research Program

The major thrust of ERDA's present oil shale research is the development of technology capable of improving total resource recovery and lowering environmental impacts and water requirements. The focus of this research is largely dependent upon development of in situ technologies that, taken together, will provide methods of exploiting each of the major geologic occurrences of oil shale. These techniques offer means of exploiting leaner and deeper shale deposits for which conventional mining is not considered economic, and may also provide alternatives for deposits to which surface processing is applicable.

Five general types of in situ processes have potential for development and demonstration in western oil shales at a level where commercial potential may be assessed. Four of these process categories are under consideration as a result of responses received from a Program Opportunity Notice issued

by ERDA in February 1976. Proposals were received from a total of nine industrial organizations. Table 3 summarizes major oil shale projects under consideration by ERDA.

Eastern oil shales of Devonian and Mississippian age represent a large potential energy resource although their extent is poorly defined. A deposit known as the Antrim Shale underlying a major portion of Michigan has been identified as having properties particularly suitable to assessment of the application of in situ techniques. An initial contract to perform such research has been signed with the Dow Chemical Company, Midland, Michigan, with an agreement in principle to conduct a four-year program.

Environmental issues that are unique to in situ oil shale processing are addressed as integral parts of all field work conducted either in house by ERDA or by industry contractors. These issues include: disposal of in situ water, migration of fluids during and after in situ processing, surface thermal problems and identification of materials leached from in situ processed spent shales. In addition to such research by the PON contractors and by Dow, specific studies related to these environmental concerns are presently funded at a number of universities. These environmental projects are summarized in Table 4 of the attachment.

ERDA's in house oil shale research, performed by the Laramie Energy Research Center and by some of ERDA's National Laboratories, is aimed at

better understanding of process parameters needed to control underground oil shale processing. This research includes field experiments in western oil shale, closely co-ordinated with laboratory research, to provide data for larger-scale projects expected to be performed by industry.

A small but important component of ERDA's program is supporting research. This includes oil shale characterization work and shale oil refining studies. It also includes environmental monitoring of surface retorting performed by industrial lessees of the Anvil Points Facility in Colorado.

Economics

Estimates of the costs to produce a pumpable feedstock shale oil by modified in situ, conventional mining with surface retorting, and by multimineral processing are listed. Estimates for both the capital cost and operating cost are based on a 50,000 bbl/day plant. For comparison purposes, production costs are shown for 100-percent equity and a 15-percent discounted cash flow (DCF). All costs are in 1976 dollars. In practice, financing might be leveraged and the required selling price lowered below the 100% equity figures.

The range of the estimates indicates the uncertainty associated with differing technologies, different grade shales, and different locations. Both the modified in situ and the multimineral approach based on dawsonite recovery are currently projected to be competitive with imported oil.

Surface retorting could be competitive within a few years if imported oil prices continue to rise. Recent studies have indicated that combined surface retorting and modified in situ processing may result in significant cost reductions and at the same time increase resource recovery.

ESTIMATED SHALE OIL PRODUCTION COST 2/

	Investment Cost $/Daily BBl	Operating Cost $/BBl	Production Cost $/BBL 15% DCF 100% Equity
Modifed in situ	5,000 - 7,000	3.50 - 5.00	8.00 - 11.00
Surface Retorting	14,000 - 23,000	4.00 - 5.00	16.00 - 25.00
Multimineral	7,000 - 9,000	2.75 - 4.00	9.00 - 12.00

However, even with favorable economic projections, no commercial oil shale facility has been built and operated. A 1975 report prepared for OMB as part of the Synthetic Fuels Commercialization Program looked at the question of when shale oil will be available commercially. It concludes:

- Without Federal help there will be no commercial shale oil plants on stream between now and 1985.
- With appropriate economic incentives, an oil shale industry could be started in Colorado and/or Utah in 5 - 8 years.

2/ The oil produced by these methods may be pre-refined to a quality comparable with Arabian crudes for an additional $1 to $4 per barrel.

A number of options are available to the Government to encourage the demonstration and commercialization of oil shale technology. One option would be to combine loan guarantee authority with ERDA's existing authorities under the Federal Non-nuclear Energy Research and Development Act of 1974 (P. L. 93-577) to assure that a full array of financial incentives is available with which to induce private sector participation. One approach being considered is to seek authorization and funding for at least one, and, possibly two oil-shale demonstration modules. It is anticipated that these modules or single trains can be at or near commercial scale of approximately 6 - 10,000 barrels per day and will be capable of expansion to full commercial-scale at approximately 50,000 barrels per day. Such expansion would be contingent upon the operation of these modules meeting pre-established standards and would include consideration of combining modified in situ retorting with the surface retorting module as an alternate to direct expansion of surface processing.

Analysis and Conclusions

There is virtually unanimous agreement that emerging technologies are needed to augment domestic energy production. Shale oil is an extremely important candidate among the new energy sources. An FEA analysis of the Synthetic Fuels Commercialization Program Task Force report completed last year indicates that:

- Oil shale production is closer to commercial acceptance than other liquid fuel alternatives.

- Oil shale technology is technically simpler than coal liquefaction technology.
- Shale oil production costs are estimated to be less than other synthetic fuels.
- Oil shale production would encourage the use of a plentiful domestic resource since after coal, oil shale is our largest fossil fuel resource.
- The overall environmental effect of oil shale plants would be similar to other synfuel plants. But oil shale plants could emit the least solids to the atmosphere, require the least water, and disturb the least land among the various synfuel options.

The capital investment required to demonstrate shale technology is large and the market is sufficiently uncertain that private firms are unwilling to make the needed investment. Yet the result of demonstrating this technology and reducing uncertainties has great national benefit.

An important factor affecting the development and growth of a shale oil industry is the role played by the Federal Government. Its influence is pervasive. It appears that the Federal Government must: (1) lease shale lands, (2) provide the economic setting within which an industry must operate, (3) ameliorate environmental problems, (4) support development of new technology, and (5) promote the operation of selected shale processing facilities on public lands.

Considerable pessimism with respect to oil shale has been expressed by the leading industrial groups capable of producing commercial quantities of shale oil between now and 1985. An objective examination of the facts reveals that oil from shale could potentially offer lower costs than other substitute liquid fuels; that the establishment of an industry requires demonstration of retorting in commercial-size modules; that many environmental impacts once believed to be unmanageable can be handled.

The following tables present additional details on ERDA's oil shale program.

TABLE 1

TYPES OF OIL SHALE RESOURCES

TYPE	DEPTH	THICKNESS	PERMEABILITY	OCCURRENCES	OWNERSHIP	REMARKS
I-Deep Western	Up to 2000'	Several Hundred Feet	Impermeable	Lower Shale Zone of Piceance Creek Basin	Primarily Federal Lands	Associated Minerals: • Dawsonite • Nahcolite
II-Shallow Western	±100' Overburden	±250'	Generally Impermeable	Utah, Upper Zone of Piceance Creek Basin	Federal, State and Private Lands	Includes "Mahogany Zone"
III-Deep Leached Western	Up to 1200'	Up to 1000'	Permeable	Leached Zone of Piceance Creek Basin	Primarily Federal Lands	Extensive local saline aquifers present, including saline compounds
IV-Thin Western	Highly variable, varies with location 100'-3000'	Thin ±50'	Varies with location	Wyoming	Federal, State and Private Lands	Multiple beds separated by barren rock
Eastern Shale-Antrim Formation	Highly variable. Surface outcrops to 1000'	200-350'	Impermeable	Areas under most active consideration located in southern Michigan. Overall shale areas widespread through Midwest	Private Lands	Antrim Shales considered primarily for gasification using in situ processes

TABLE 2

POSSIBLE TECHNOLOGY OPTIONS FOR OIL SHALE

SURFACE RETORTING	MODIFIED IN SITU (Vertical or Horizontal)	TRUE IN SITU
By shale quality: Over 25 gallons per ton 20-25 gallons per ton 15-20 gallons per ton 10-15 gallons per ton Less than 10 gallons per ton	By shale type: Thick beds Thin beds Shallow beds Association with water (See Table 1)	By shale type: Western Types I-IV (See Table 1) Eastern
By mining type: Room and Pillar Strip Deep Others	By shale quality: Greater than 25 gallons per ton 20-25 gallons per ton 15-20 gallons per ton 10-15 gallons per ton Less than 10 gallons per ton	By preparation technique: Leaching Fracturing By production technique: Internal combustion Hot gases (air, oxygen, hydrogen)
By process: Internal combustion External heated gas (various kinds) External heated solids	By volume of mining: 20% to 60%, with or without surface retorting of mined shale	By output mix: Oil primary Gas primary Associated mineral extraction
By technique: Gravity flow Rock Pump Horizontal Kiln	By preparation technique: Degree of rubblizing Size of chambers	
By output mix: Primary oil Oil and gas mix Associated Minerals Primary gas extraction	By production technique: Internal combustion Hot gases (air, hydrogen, oxygen) Electrical	
	By output mix: Oil primary Gas primary Associated mineral extraction Varied mixes of above	

TABLE 3

MAJOR OIL SHALE PROJECTS UNDER CONSIDERATION

MAJOR PROJECTS	PERFORMER	LOCATION	STATUS
ANTRIM SHALE	DOW	MIDLAND, MI	UNDERWAY–OCT 76
TRUE IN SITU	TALLEY-FRAC	ROCK SPRINGS, WY	T.B.D.
SOLUTION MINING	EQUITY	RIO BLANCO COUNTY, CO	T.B.D.
VERTICAL MODIFIED IN SITU	OCCIDENTAL	DEBEQUE, CO	T.B.D.
MODIFIED IN SITU	GEOKINETICS	UINTAH COUNTY, UT	T.B.D.

TABLE 4
TECHNOLOGY BASE

Subprogram/ Category/Element	Institutions Performing Tasks	BA Funding to Institutions Performing Tasks in FY77 (Millions of Dollars) [1]
Oil Shale/Oil Production		
In-House and University Tasks	Laramie Energy Research Center (LERC)	2.95
	Lawrence Livermore Laboratory (LLL)	2.30
	Sandia Laboratories (SL)	2.20
	Los Alamos Scientific Laboratory (LASL)	0.55
	Universities	0.16
Industry [1] Contracts	Talley-Frac (true in situ;	
under consideration	Occidental Petroleum (vertical modified in situ;	
	Geokinetics Oil Shale Group (horizontal modified in situ—surface uplift;	
	Equity Oil Co. (horizontal modified in situ—solution mining;	
(Total PON Funding)		8.04 [2]
Oil Shale/Gas Production		
In-House Tasks	LERC	0.45
Industry [1] Contract	Dow Chemical Co. (gasification of Antrim oil shale)	3.15
Oil Shale/Environmental Control Technology Research Activities		
In-House and University Tasks	LERC	0.68
	Lawrence Berkeley Laboratory (LBL)	0.02
	Universities and other contractors	0.47
		Subtotal 20.97
Supporting Research	LERC	1.25
	Universities	0.06
		Subtotal 1.31
		Total 22.28

1 The names of the contractors and funding to them are subject to final contract negotiations.

2 Total PON funding to be allocated among contractors when contracts are awarded.

TABLE 5

ENVIRONMENTAL RD&D PROJECT ACTIVITIES SUMMARY

Environmental R&D Needs	RD&D Projects	Environmental Category	Primary Pollutants	Planned FY77 Accomplishments
Oil Shale Subprogram • Overall characterization of pollutants • Data for control technology development • Baseline data for EIAs • Water resource requirements, effects, and conservation	• Environmental monitoring of field operations at Rock Springs Site 9 (LERC)	• Air and water	• Overall pollution assessment	• Characterize water produced as a result of oil shale retorting • Characterize quality of natural waters and quantify usage • Identify and define flare gas constituents • Perform thermographic analysis to evaluate postburn surface effects
	• Environmental baseline monitoring at the selected White Mountain and Green River sites (LERC)	• Air, water, and land	• Ambient quality	• Monitor site meteorological aspects • Characterize site physiographic, geologic, and soil features • Monitor groundwater and surface water quality and quantity • Identify and define biological, historical, and scientific resources • Complete EIA for White Mountain site
	• Biological degradation of retort water (University of Southern California)	• Water	• Organic material	• Continue studies to develop a practical method to decompose soluble organic pollutants in retort water
	• Conservation of water with in situ oil shale development (LBL)	• Water	• Trace elements	• Provide plans for continuous allocation of water • Provide strategy for real-time monitoring of water quality • Identify methods for treatment of combustion gas scrubbing water • Identify control methods for in situ combustion retorting • Complete report presenting data and results of study
	• In situ spent shale leaching rate study (Texas Tech. University)	• Solid waste	• Trace elements	• Continue studies to determine selected inorganic chemical parameters of environmental significance in retorted oil shale leachates

TABLE 6
DETAILED RESOURCE REQUIREMENTS
(in Millions of Dollars)

Funding Distribution	FY76 ERDA Appropriation		TQ ERDA Appropriation		FY77 ERDA Appropriation	
	BA	BO	BA	BO	BA	BO
Operating Expenses						
Oil Shale	13.72	9.84	1.95	2.00	20.97	12.01
Supporting Research	1.27	1.11	0.30	0.30	1.31	1.31
Subtotal	14.99	10.95	2.25	2.30	22.28	13.32
Plant and Capital Equipment						
Oil Shale	0.32	0.26	0.10	0.08	0.45	0.44
Supporting Research	0	0	0	0	0.05	0.05
Subtotal	0.32	0.26	0.10	0.08	0.50	0.49
Program Total (Federal)	15.31	11.21	2.35	2.38	22.78	13.81

Senator METCALF. Thank you very much, Dr. White.

Is ERDA satisfied that we have a potential of developing oil shale and solving the pollution problems?

Dr. WHITE. Very definitely. We wouldn't be proceeding if we didn't feel we had a very real possibility of doing that and in a fairly short term. I see no reason why, if we pursue this vigorously, why we couldn't have a demonstration plant under design and construction, at least design for construction, in the next decade which would answer the questions which in turn would mean that by 1985 we would have some answers to the total impact of oil shale.

Senator METCALF. Do you agree, Mr. Farrand?

Mr. FARRAND. Since Dr. White has been so gracious in confirming some of my comments, I feel reluctant to comment on his. I honestly feel that if we knock down the air quality and off-site disposal restraints, that we could achieve the same results without having to spend the money with the prototype leases that we have already seen and, as well, take two additional in situ leases we hope to sell at the end of next year.

Senator METCALF. But there still would be significant air and water pollution if we went the route that you are suggesting?

Mr. FARRAND. Yes; there will be——

Senator METCALF. Dr. White has indicated, or I hope he has indicated, that he believes we are at least on the threshold of obtaining some reasonable oil shale development without significant air and water pollution.

Dr. WHITE. Yes; I think it could be controlled. Let's face it, there are some questions that we do not have the answers to today.

Senator METCALF. I completely understand and that is why you are suggesting, of course, that there be a pilot plan or some sort of program larger than anything we have gotten underway so far.

Dr. WHITE. Yes; I think you really need to build essentially at a commercial level either above ground or modified, to have confidence in what degree that sort of operation is going to cost the environment, both in air quality and particularly underground water. We are lacking information today.

Senator METCALF. Our whole purpose is to explore this area. This hearing is to inform our colleagues in the committee about where we are going and what the possibilities are. I am very much impressed when you tell me that you believe that if we move quickly enough we could have something going in 12 months. Is that correct?

Dr. WHITE. Yes; something committed and under design.

Senator METCALF. Yes; something underway.

Dr. WHITE. Yes; underway. I think it is possible.

Senator METCALF. Of course, this is such a tremendous resource that we need to do something about it.

Dr. WHITE. Let me also just comment. I certainly would second Mr. Farrand. If our industrial friends are going to testify later, just leave them alone and the incentives and the questions are easily answered by the private sector, I would be happy to see us step aside and consider the job done.

Senator METCALF. I think you made that very plain and I think the Congress would also be happy to see that done. I don't know where the money in the budget is for the plan, anyway.

Dr. WHITE. Well, the budget is a little fuzzy on this point right now.

Senator METCALF. The budget is fuzzy on a lot of points. Anyway, I am delighted to have you here and I think that you made a contribution to our understanding so that we can be prepared to do something as quickly as Congress opens and we will have more precise hearings as the question develops and, of course, we are going to hear from some of the companies involved later on this morning.

Mr. HARVEY. Dr. White, at the end of your statement you list five things that the Government ought to be doing to help oil shale development. In the third one, you say the Government must "ameliorate environmental problems." Would you expand on that?

Dr. WHITE. Really, I was just referring to the problems Mr. Farrand spoke about earlier, the air quality, the major one that I think clearly Government action is the crucial thing rather than the technical information kind of thing that has to be answered by further work in the field, such as underground water.

Mr. HARVEY. So you are saying the Government needs to change the standards?

Dr. WHITE. Yes.

Senator METCALF. I doubt very much if they are going to persuade Congress to substantially change the standards unless there is a demonstration that there would not be serious violations of air and water quality standards. Perhaps some discussion that Mr. Farrand entered into, that the difference between certain geographic areas and so forth would justify, to use your word, amelioration, but I think you are going to have a job of selling the Congress on abandoning substantial air and water quality standards.

Mr. FARRAND. If I may comment for a minute on that, Mr. Chairman, what they are talking about in the EPA study is not abandoning air quality in those rural areas. Because of the mix of two different substances, pollutants, the effect is not as bad in rural areas if you raise one or two of those standards as it would be in an urban area where you are producing tons and tons of carbon monoxide and other oxides all day long from automobiles and other sources. The net effect would not be any worse or any better as a result of any change it might make in the hydrocarbon standards.

Senator METCALF. Thank you very much. Thank you all.

Mr. Herget, we are delighted to have you before the committee again. It seems to me that the last time we were discussing this question you were here on that offsite disposal question.

Mr. HERGET. That's correct, yes.

Senator METCALF. You can go on from there.

STATEMENT OF WALTER T. HERGET, PRESIDENT, RIO BLANCO OIL SHALE PROJECT, ACCOMPANIED BY BLAINE MILLER, EXECUTIVE VICE PRESIDENT, RIO BLANCO, AND DARRELL MILLER, ATTORNEY WITH STANDARD OIL

Mr. HERGET. Mr. Chairman, I appreciate the opportunity to review the status of oil shale and our particular project with you today.

My name is Walter Herget. I am an employee of Standard Oil Co. (Indiana) and president of the Rio Blanco oil shale project of Stand-

ard and Gulf Oil Corp. With me today are Blaine Miller, executive vice president of Rio Blanco and an employee of Gulf, and Darrel Miller, attorney with Standard.

In your letter of October 18, Mr. Chairman, you pointed out the fact that the Senate Subcommittee on Minerals, Materials, and Fuels, has maintained continual oversight over the Interior Department's Federal prototype oil shale program since December of 1973. You also expressed concern with Federal Lessees' suspension requests while some operations on private land are reportedly taking place.

If I understand your letter correctly, you are wondering about the merits of the prototype program if shale oil can be developed in private land without assistance from the Government. That is a legitimate question and one which I believe can be answered.

First of all, while some companies have been reported to have said they can proceed under certain conditions with no Government assistance, no construction projects are underway today to our knowledge.

I would like to put our current oil shale situation into perspective. In order to do that, it is necessary to recall the atmosphere which existed when Gulf and Standard bid on tract C–a.

The prototype oil shale program was announced in December of 1973, in the middle of the Arab oil embargo. At that time, the Federal Government was strongly behind the program and it appeared Congress would adopt a national energy policy which would include oil shale. There was a feeling of urgency at that time and it appeared there should be real efforts to start moving away from dependence on foreign oil. It seemed that America had learned its lesson about OPEC.

The prototype program was carefully prepared for about 5 years before it was initiated. Although it contained rigid environmental requirements, the program also included economic incentives for private industry to reach commercial scale production as soon as possible in order to give oil shale development a fair test. One of these incentives is the ability to offset the last two annual bonus payment installments by certain approved expenditures by the lessees to develop the tract. That is a significant factor when the last two payments total $84 million as is the case with C–a.

Shortly after acquiring the lease, Gulf and Standard put together a team of management and professional personnel known as the Rio Blanco oil shale project to prepare the required detailed development plan and pursue tract development within the spirit and intent of the prototype program. A number of outside contractors were employed to perform environmental, mining, and processing studies.

Tract C–a was selected by the Department of the Interior as a likely open pit mining test with surface retorting. However, we did study both underground and open pit mining, as well as all retorting technologies available to us at the time.

Our studies revealed that open pit mining would cost roughly the same per barrel as underground room and pillar. However, by open pit we determined we could recover nearly four to five times the shale oil available by the room and pillar method.

In order to get the maximum recovery of the resource, our studies showed that mining of nearly all of the tract would be necessary. Therefore, the processing plant facilities should be offtract and dis-

posal of processed shale and overburden would have to be placed offtract until the oil shale pit was large enough to begin backfilling.

The six-volume Interior Department Environmental Impact Statement projected offtract disposal for tract C–a development. The EIS stated that C–a lessees would have to seek a special land use permit from Interior to acquire offtract Federal land. However, the Department's Solicitor subsequently determined that the Secretary actually does not have the authority. Legislation was introduced in both Houses of Congress. I testified in favor of the bills, Senate bill 2413 and House Resolution 11163, but neither bill came out of Congress.

Another problem involving land was identified as a result of socioeconomic studies we had underway. Although not required by the lease, we felt that our program could not be complete without a comprehensive effort to provide the best possible and least disruptive plan for community growth brought about by tract C–a development.

We employed three different consulting firms to assist in this area of activity. One of the first findings from these studies was that the community of Rangely, Colo., was the best suited location for our employees. However, in order for Rangely to expand, additional land was necessary. The great majority of the land adjacent to the community is owned by the Federal Government. Since there was doubt that the Secretary of the Interior had the authority to make this land available in a timely fashion to a community, the Department again sought corrective legislation. However, no specific bill was introduced in the last session of Congress.

Another problem surfaced when our air quality studies in the area of the tract revealed that natural background levels of some pollutants occasionally exceed Federal air quality standards. Various efforts to amend the Clean Air Act in the past session of Congress were not completed so this situation remains unresolved. These problems are treated in detail in our application for suspension.

Because of these three considerations—the offtract land question, the Rangely land situation, and the air quality problems—we requested, and were granted, a suspension of operations. Because of the complexity of the questions, we requested 2 years but were granted only 1 year beginning this past September.

Of the three problems which caused us to request suspension, it appears some progress may have been made in regard to one of them. With the passage of the Federal Land Policy and Management Act of 1976 in the last days of the congressional session, authority may now exist for the Department of the Interior to make Federal land available to communities. If the interpretation of the act and subsequent guidelines and regulations prove this to be the case, the Rangely land problem may be resolved within 1 to 2 years.

Nevertheless, because of the continuing uncertainties facing us, we are looking at alternative technologies and other ways to develop our tract.

We are continuing to study underground mining. The room and pillar method is a known technology.

We have had conversations with Union Oil Co. and Superior Oil Co. Union has developed a surface retort of their own. The relative advantages of the Union system appear to be similar to the Tosco II retort.

Superior Oil Co. intends to process shale, Nacholite which produces soda ash, and Dawsonite which produces alumina. They are interested in participation on their tract of private land located north of tract C–a. Our studies show we have no appreciable Nacholite on our tract and the Dawsonite is very deep and, under our present development plan, would not be reached until the 1990's if there is enough to be commercially feasible to develop. Therefore, the major advantages that Superior's process may enjoy do not appear to be transferrable to tract C–a.

We recently processed 100 tons of Colorado oil shale in a test retort in cooperation with the Lurgi Co. in West Germany. We are still reviewing the results of the test but believe this retort represents second-generation technology even though the results of the run appear to be satisfactory. This may represent quite an advancement in the state of the art.

We have also talked with Occidental about joining us on tract C–a. However, as you know, Occidental is now a partner on the C–b tract and this potential no longer exists.

Although we still consider in situ as a second-generation technology, we are studying a modified in situ method as an alternate for tract C–a development.

Gulf/Standard believe that the modified in situ approach offers great potential. It combines limited mining with underground retorting and offers a means for overcoming the basic problem of creating permeability. The modified in situ method is a compromise between surface retorting and true in-situ retorting and, therefore, does not completely overcome the disadvantage of either. However, relative to surface retorting, it offers the potential for reduced cost, good oil recovery, and reduced environmental impacts, and is based extensively on existing technology. Much development work remains to be done and the costs will be very high. However, development is not confronted by insurmountable technical obstacles so that the rate of technology development should be in reasonable proportion to the magnitude of effort. We think it important enough to warrant a considerable study effort to determine if the modified in-situ method can overcome the obstacles to the development of tract C–a.

We are currently working on a study program to generate a modified in situ development plan for tract C–a. Expertise of Gulf and Standard research departments, as well as that of five contract organizations, is being brought to bear on this program.

Also, consistent with the National (ERDA) Laboratories technology transfer policy, we are working closely with Lawrence Livermore Laboratories, Larimie Energy Research Laboratories, and others. Their help in the areas of applied research, technical laboratory and field support, and technical environmental support will be invaluable. The work of these laboratories is available to everyone and the results of their work is in the public domain.

Even with in situ, we may still need off-tract land for plant siting and waste disposal. In a modified in situ operation, some mining is necessary and some surface retorting will probably also be carried out. We expect our studies to reveal whether or not off-tract disposal is necessary.

The in situ approach to tract development has a number of unknowns including some environmental effects. While overall surface

disturbance would probably be less and hence have less effect on the terrestrial and aquatic ecosystems in the area, we don't yet know how such development would affect air and water quality.

Our review of the C–a lease and the Interior Department environmental impact statement shows that in-situ development is mentioned as a possibility for all prototype tracts. Therefore, we feel we could use this technology if our studies demonstrate that it is feasible.

In summary, we feel we have tried to pursue our project in the spirit of the prototype program as originally set forth. When the problems I have reviewed became evident, we tried to resolve them to the best of our ability with the appropriate governmental entities. We believe we have been diligent in pursuing every reasonable option available to us.

During our suspension period, we will continue to work with the appropriate people to try to resolve the problems holding back oil shale development. We will also continue to study alternative methods of development.

We still believe that shale oil should be developed and in the orderly manner called for in the prototype program. However, some assistance from the Government and Congress may be necessary to resolve off-tract disposal and air quality problems. There is still a likelihood that some operations will need economic assistance in the demonstration phase of oil shale development.

Thank you for your attention. I will try to answer any questions you may have.

Senator METCALF. Thank you very much, Mr. Herget. Mr. Harvey has prepared three special questions that I am going to ask you and I am going to ask the subsequent members of the industry.

The first is, the Interior Department has stated that commercial oil shale technology will be competitive for the world price of $15 to $17 per barrel by 1980. This morning they said they might even get lower than that. Would you agree with that assessment?

Mr. HERGET. Our studies show that the open pit mining and surface retorting systems that we study, that we would have to receive about $20 per barrel for the shale oil in order to get a 15-percent return on the investment on a cash flow basis. This is, of course, above the present opening price today. We are looking at these alternate methods which may reduce the cost.

Senator METCALF. Your opinion is that the price of $15 to $17 per barrel would not be competitive and you would have to receive at least $20 per barrel.

Mr. HERGET. For the system that we have studied and where we filed a detailed development plan.

Senator METCALF. The second question: Protection of air and water quality will undoubtedly prove costly during the development of the leases. In the opinion of some observers these environmental costs may be prohibitively expensive under the most favorable circumstances. We had some testimony on those costs by the last witness. Can you give us your best estimate of the range of costs of environmental protection and your company's ability to absorb those costs?

Mr. HERGET. I don't believe we have broken out the costs for environmental protection, but in my opinion they are not the biggest part of our expenses.

Mr. MILLER. Mr. Chairman, one thing that I think is clear is that the company will not absorb these costs. They have to be passed on to the public in the form of higher prices. Environmental costs are a part of your overall costs and they invariably find their way into the price of the product.

Senator METCALF. Nevertheless, you think you can, whether you absorb it or pass it on, take care of these environmental costs within the range of $20 a barrel?

Mr. MILLER. Yes, sir.

Senator METCALF. You were including the environmental costs when you suggested that that would be a possible range?

Mr. MILLER. Yes, sir, in the $20 a barrel that Mr. Herget has quoted is for our open pit, surface retorting pits. He pointed out that we are looking at alternatives and we are hopeful that those costs can be reduced.

Senator METCALF. The third question, it has been suggested that there be a joint industry-Government research and development effort to advance oil shale technology and the leases be suspended pending the organizing and completion of that effort. Would you comment on that?

Mr. HERGET. I believe I mentioned in my testimony that we are working with the National Laboratories and the Laramie Research Center, and we welcome that they and we are doing it during our period of suspension.

Senator METCALF. Would you say the leases should be suspended pending that joint effort?

Mr. HERGET. The leases are already suspended and we are working with them.

Senator METCALF. The suspension should continue pending that effort, then? The leases are suspended for 1 year, isn't that right?

Mr. HERGET. Right. We would hope to get our studies done before the suspension is ended.

Senator METCALF. Mr. Harvey, do you have any questions?

Mr. HARVEY. Yes; I have one. You indicated in your statement that you thought you would still need off-tract land even if you were going in situ or modified in situ. What would you be using it for?

Mr. HERGET. It could be for off-tract waste disposal or off-tract homesites. Particularly the plant siting because I don't think you would put a multimillion dollar plant over a retort.

Senator METCALF. We are going to have a decision regarding the impact of the recent 1976 act and whether or not that will take care of your needs for off-tract land before we need to consider legislation on that matter?

Mr. HERGET. This 1976 act, I believe, addresses the Rangely land problem.

Senator METCALF. Do you think it answers your problem?

Mr. HERGET. I believe so, and I believe Mr. Farrand indicated so also.

Senator METCALF. So the request you made at the previous appearance is no longer needed because that was taken care of by the legislation that was subsequently enacted?

Mr. HERGET. That takes care of one of the three problems, the Rangely land. We don't know yet whether we will need off-tract land or not on this new alternate method we are looking at.

Senator METCALF. Will that require a test case in court or would you just get an opinion from the Department of Interior?

Mr. HERGET. I don't quite understand.

Senator METCALF. Mr. Harvey tells me that under the new law off-tract disposal is prohibited; is that correct?

Mr. HERGET. For offsite disposal and plant siting; yes.

Senator METCALF. Thank you very much, Mr. Herget. Thank you for coming. We look forward to seeing you again as we go forward.

Mr. HERGET. I hope so.

Senator METCALF. The next witness is Mr. Earl Ramsey, program director, White River shale project. Mr. Ramsey, we are delighted to have you here.

STATEMENT OF EARL H. RAMSEY, PROGRAM DIRECTOR, WHITE RIVER SHALE PROJECT

Mr. RAMSEY. Mr. Chairman, we appreciate the opportunity to be invited to this subcommittee meeting today. My name is Earl Ramsey. I am program director of the White River shale project, Salt Lake City, Utah.

The White River shale project was formed in June 1974 by Phillips Petroleum Co., and Sunoco Energy Development Co., the owner of Federal oil shale lease U–a, and Sohio Petroleum Co., the owner of Federal oil shale lease U–b. The project was formed for the express purpose of establishing a plan for joint development of the leases.

Federal lease U–a was acquired for a bonus bid of $75 million. Federal lease U–b was acquired with a bid of $45 million. Over $72 million of this $120 million has been paid by the three companies in the first three bonus payments. In addition, we will have spent another $15 million through the end of the current year, or a total of $87 million. Approximately $7 million will have been spent in developing an extensive inventory of existing plant and animal life, surface and subsurface water, and air quality. Following the establishment of this baseline, the lease requires a 2-year monitoring program of all of the above-described physical resources prior to any development work on the tracts.

Another significant portion of the $15 million was required to comply with the lease term which provides for a detailed development plan to be prepared and submitted by the lessee. The plan includes a schedule of the planning, exploration, development, production, processing, and reclamation operations and all other activities to be conducted. The lease requires that the detailed development plan conform to all Federal, State, and local regulations and standards for air, water, and land quality and that it include environmental safeguards and lease land rehabilitation.

The White River shale project submitted the detailed development plan for tracts U–a and U–b on June 3, 1976.

On June 27, 1976, the owners of Federal tracts U–a and U–b applied for a suspension of operations of the lease terms. One of the reasons

for the application was that during the environmental baseline study the White River shale project discovered that for intermittent periods natural background levels of nonmethane hydrocarbons and certain oxidants exceed Federal clean air standards.

A 1-year suspension of operations was approved for both U–a and U–b effective November 1, 1976.

During the last 2 years as the project team has proceeded with the environmental baseline program and the preparation of the detailed development plan, some very significant external events occurred and some internal decisions were reached which impacted seriously on the development of an oil shale industry. Some of the most significant problems currently associated with the commercialization of oil shale are:

1. In the last 2 years, a period of continued inflation, the estimated cost to construct a 100,000 barrels per day shale oil plant has escalated from the $600 million range to over $1.5 billion. The latter cost has been verified in a detailed study carried out for White River shale project by one of the country's leading contractors.

2. The present stage of retort technology is not adequate to allow for proceeding directly into commercial development.

3. A commercial oil shale installation will consist of very large and complex units of mining, retorting, and upgrading, all close coupled and interdependent. A high operational risk is involved since each operating unit must have a high availability, or "onstream" factor, to maintain the desired production levels. Failure to achieve this availability has a disastrous effect on project economic viability.

4. One of the greatest concerns to our group of companies is the possibility of having product prices subject to some form of control while our capital expenditures and operating costs are rising each year.

We also have a national concern today that oil companies can help solve. That problem is finding and developing enough energy to meet the needs of the American consumer. We now know that to solve our energy problem, we must begin to make greater use of fuel supplies beyond those directly related to oil and natural gas. As you know, many oil companies, including my own, have already made substantial investments, both in terms of capital and manpower, to develop those other energy sources. It is in the national interest that we be allowed to continue in this direction. To do otherwise would again delay development of new energy sources and would be bad for the people of this country.

First, oil companies can help provide some of the enormous capital investment dollars which will be required to develop alternative fuel techniques. In addition, the development of alternate fuels by oil companies would have the advantage of bringing the technical manpower and research knowledge developed from other energy programs to bear on the problems of the new industry.

Notwithstanding all of the aforementioned problems, the White River shale project believes that a program for oil shale development should be carried to the point that the major technical and economic uncertainties are resolved. We are recommending the following programs for the development of oil shale:

As a first step, a program should be created that insured demonstration of a wide range of technologies for shale processing. A care-

fully considered number of modules should be built. These modules should allow for demonstration and evaluation of the technology using full commercial-scale equipment. The module would most probably be a single retort coupled with attendant mining and other required supportive facilties. The demonstration phase will provide a sound base for predicting capital, environmental, and operations costs for an expanded commercial facility.

Our studies indicate that construction and operation of a module will cost in the $100–$200 million range and will be unprofitable. In light of the technical and economic uncertainties, this cost level precludes the demonstration of mining and retorting technology sponsored entirely by private industry. We believe the most realistic approach would be joint government-industry funding through the technology development phase. A basis for industry to acquire the Government's interest in the plant should exist. If the technology is successfully demonstrated and if economic conditions permit, the plant could then become the core for an expanded commercial venture.

We have pointed out some of the problems facing the yet to emerge oil shale industry and we have discussed how we believe some of the problems should be attacked. As mentioned earlier, the financial investment already made by our three companies is approaching $87 million. We believe this fact shows our sincere interest in developing an oil shale industry.

In summary, the White River shale project firmly believes that from a national interest viewpoint, a program for oil shale development should be carried to the point that the major technical and economic uncertainties are resolved. The most efficient and timely way to remove the problems and uncertainties is to proceed at once in initiating the demonstration module program described earlier in this statement.

Thank you.

Senator METCALF. Thank you very much, Mr. Ramsey.

Mike, will you propound the questions? You already answered one of the questions in the course of your prepared testimony. I am going to ask counsel to ask you the other questions.

Mr. HARVEY. Mr. Ramsey, going back to the questions you were asked earlier, what range of crude oil prices do you think would be necessary?

Mr. RAMSEY. Mr. Harvey, in two ways. First, we did a check and analysis based on a hundred thousand barrels per day of upgraded synthetic crued shale oil. This included financing on a 100-percent equity basis. It included a pipeline, a powerplant and the upgraded facilities and it was in 1975 dollars. The capital cost was in excess of $1½ billion and the price per barrel indicated was $20 per barrel.

Now, the second way I would like to answer that question is this: There are many questions that we can't answer at this point in time. Some of them include the ones that have been asked earlier today, such as the environmental costs. We can only guess at the environmental costs, but we believe that following the successful demonstration program that we have described that the industry will have a much better handle to put a figure on both capital and operating costs and environmental costs and until that time we are only guessing.

Mr. HARVEY. Thank you. You have answered the second question.

Let me ask one other one. Have you asked ERDA to help you out with funding on specific projects?

Mr. RAMSEY. We have had conversations with ERDA. We were invited to present to the Commercialization Division earlier this year what we thought was the current condition of the oil shale industry and we pretty well presented in more detailed form what I have described here today. We have not formally asked for any help, no, sir.

Mr. HARVEY. Thank you.

Senator METCALF. Thank you, Mr. Harvey. Thank you very much Mr. Ramsey.

Again, these are only preliminary hearings. We are going to have specific legislation before us as soon as possible after the beginning of the new Congress and we look forward to seeing you again on more precise legislation at that time. Thank you for coming.

Our next witness is Mr. Donald Baeder, executive vice president for research and development, Occidental Oil Shale, Inc.

STATEMENT OF DONALD L. BAEDER, EXECUTIVE VICE PRESIDENT, RESEARCH AND DEVELOPMENT, OCCIDENTAL OIL SHALE, INC., ACCOMPANIED BY RICHARD RIDLEY, EXECUTIVE VICE PRESIDENT, OCCIDENTAL OIL SHALE, INC.

Mr. BAEDER. Thank you, Mr. Chairman.

My name is Don Baeder, and I am executive vice president of Occidental Petroleum Corp. for research and development. I have with me Dick Ridley, who is executive vice president of Occidental Oil Shale, Inc. I am pleased to have the opportunity to give you an update on Occidental's activities in oil shale, and to comment on the leasing program for shale oil lands administered by the Department of the Interior.

Most of the news coming out on oil shale in the past few years has not been very heartening to a government sorely in need of an alternative to OPEC oil. Although a number of major oil companies entered into leases for four tracts of Federal Government oil shale lands in 1974, at a bid cost of $450 million, all have now requested and obtained 1-year suspensions of lease terms; and several of the companies have dropped out completely. All had intended to use above-ground processing. It is now evident that development along this avenue is many years into the future. In contrast, we at Occidental continue to move ahead aggressively with our proprietary-in-situ process.

Occidental entered the shale oil field in 1972 by optioning a small, low-grade, and I emphasize "low-grade," oil shale tract in Colorado for in situ field tests. This commitment preceded the Arab oil boycott. During the ensuing 4 years in the field, Oxy has conducted three moderate-size retorting tests and one large scale, essentially commercial-size, test. It has expended $45 million of its own money in this work. The recent announcement of a joint venture agreement between Occidental and Ashland Oil for C–b tract development attests to the success of this effort. I will discuss the status of this agreement after a short review of the status of the field development work.

I have with me some slides to give you an appreciation of the scale and magnitude of our operation in Colorado, and with your permission I would like to show them and perhaps have Dick Ridley comment on them as we go along.

Senator METCALF. Go right ahead.

Mr. RIDLEY. There are several slides here that will give you an overview of the operation and a view of the countryside. The mine site is shown on the map in the background. We will get a closer view in a minute. As you look through some of these slides you might note there is not the pollution problem one might anticipate from some of the comments that have been made. We are working in a cleaner air, and we are not talking about a city type smog situation.

This is the main mine which we referred to as our commercial sized mine, and there are two levels shown. You see a series of trailers and buildings down at the lower level and another building at the upper level. The distance between is 270 feet and our in situ retorts cover the entire zone between the two levels.

This is looking down from the upper level to the lower level. Our mining operation is not small. It is a signilcant mining operation. We use large scale 10-yard bucket load haul dump for front end loaders. You can see the size of the drift. This one is about 20 feet high by 20 feet wide. This is the largest drilling jumbo that we use. It will drill into a tunnel of the size that you just saw.

More work underground. This gives you another perspective of it, loading the rock out in these 10-yard buckets and carrying the rock to the surface.

All of this mining work that you see is strictly preparatory work to get to the oil shale formation or to the location where we want the in situ retorts.

The retorts, as I say, on this property 270 feet high, and they consist of essentially a pile of rock 120 feet by 120 feet in horizontal dimensions, 270 feet high, broken rock, and we blow air in the top and start the retorting process and this is a picture of the blowers used for the retorting process to blow the air in. This is a Venturi scrubber which is a piece of equipment used to clean up the product gas coming off of the retort, both oil and gas come off the retorts since you put air into them to start with and have a fire in that retort.

This is another shot of the underground equipment associated with our one large test room. The man is standing right in front of a bulkhead and this is a steel plate that blocks the entrance to one of these underground chimneys. Behind this is this mass of rock. The big structure in the upper left part is the burner which is used to start the process. We start by blowing air into the retort and some fuel for a period of hours to ignite the mixture and get enough heat into the top of the retort to start the process going, then we cut off the supply of outside fuel and the process is self-sustaining only by the addition of air.

This is the control room underground. We have produced in excess of 30,000 barrels off of our last test retort. It has gone out to test markets, as Mr. Baeder will describe in a minute, and go out both by tank car and by rail.

Thank you.

Senator METCALF. Thank you very much.

Mr. BAEDER. May I go back and present to you very briefly the status of our commercial development activities? I think we can summarize these very briefly.

We have burned four retorts. The first three we called research retorts. Retort 3 using a design ideally suited to rich shale seams 100 to 200 feet high was an unqualified success in terms of yield, pressure drop, recover gas rates, et cetera.

Retort 4 was a much larger retort testing an advanced design specifically suited for retorts 300 to 400 feet in height. This retort was 270 feet tall, almost as tall as a football field is long. To give you an appreciation, if you take this room that we are in and double its floor space, move the walls out 100 percent in each direction, then go up about 8 times higher than the normal ceiling in here, you would have a visual observation of the size of retort 4. This retort was ignited last December, started producing oil in January, and as of June we produced 30,000 barrels of oil from that retort. Five thousand barrels of this oil was burned at Consumers Power in Michigan without any problems. It was burned directly.

Retort 4 had some problems, but produced expected oil yield in well rubblized zones. Approximately 30,000 barrels of oil were recovered from this test. The problems encountered, geologic in nature, have been solved—to the extent tested—and the second large-scale retorting test will start in early spring, 1977. This retort design incorporates several significant improvements over the first test.

While our confidence in retort 3 design is higher, both systems are considered to be potentially viable—economically, technically, and environmentally.

Retorting improvements—as opposed to rubblization improvements—over the present state of the art for aboveground technology are being tested. These proprietary discoveries should give significant yield improvements in commercial operations.

Our technology is proprietary. Ten patents are already approved for issuance, 20 to 30 more are in the Patent Office and approval is expected, and additional applications are being filed. Even as our field program progresses, we continue to spend additional R. & D. money to advance the technology.

It should be pointed out that, in view of our energy crisis, Dr. Hammer promised President Ford that Occidental would license this technology at a reasonable royalty rate, namely 3 percent of the selling price of raw shale oil. We believe this is reasonable in view of the risks we have undertaken, the expenditures we have made to secure our proprietary position, and the value of our technology to the potential user. We have had discussions with several parties and are ready to discuss licenses with all potential developers of our Nation's vast oil shale reserves.

The Ralph M. Parsons Co. was employed in early 1974 to undertake the engineering design studies, and from these to prepare capital and operating cost estimates. These included an initial feasibility report and two subsequent design manuals, for the D–a shale property, which is the low-grade property that we are currently working on, and one for Colorado C–b.

With high-grade shale our economic projections continue to indicate that we can produce, transport, and upgrade shale oil at a cost com-

petitive with OPEC crude at today's price and at returns that are acceptable to industry. Our studies also indicate that we can do this in an environmentally acceptable manner. I ought to comment that in these estimates I am giving you, over 10 percent of the capital investment is included for handling water use and purification. Another 10 percent, closer to 15 percent, goes into handling air quality problems so in the investment and economics I am quoting to you, we have included sufficient investment to cover any environmental problems that we can see at the present time.

As you can appreciate with the status of our development, there remains certain risks that can only be measured on a commercial scale operation. We believe these risks are worth taking. Our plans are to push forward in a prudent stepwise commercialization program that will reduce and eliminate the last remaining technical uncertainties as we proceed. It is unfortunate, but true, that we must proceed in the face of several regulatory uncertainties. We are hopeful of eventual success.

Last February 1976, ERDA published a PON for in situ development of oil shale resources. Occidental responded and was selected for contract negotiations. These negotiations are underway, and we expect to have a signed contract shortly. Under this PON, Oxy proposed that ERDA fund large-scale tests of two advanced systems as well as a fundamental rock fragmentation program—all under a 2-year, first-phase contract. A second phase would include a 2,500 B/D two-retort cluster, possibly on the higher grade oil shale tract, Colorado C–b. It is premature to go into further discussions of this ERDA contract. We believe this ERDA funding, if structured properly and given a sense of urgency, can be helpful in accelerating this development by providing out advanced technologies in demonstration-type programs. We are anxious to work with them on a realistic basis that will advance the development of shale oil, but will not jeopardize our proprietary position which we have pioneered to earn.

On November 3, 1976, Ashland Oil Co., announced that Ashland and Oxy had a joint venture agreement to develop the C–b oil shale tract using Oxy's proprietary modified in situ technology. Occidental will earn a 50-percent interest in the tract and become the operator. A modified detailed development plan will be submitted in early 1977. Occidental anticipates early development of this tract, contingent primarily on obtaining timely approvals of the necessary environmental permits.

Oxy first approached the Federal Government almost 3 years ago in an effort to expedite the commercialization of its modified in situ shale oil process. Much valuable time has been lost because of the lack of responsiveness of the Federal Government in this matter. We estimate that it will probably be 1981 before significant production begins on the C–b site at the earliest. This 4- to 5-year leadtime is made up of 6 months to 1 year to obtain final Federal approval on a modification of Ashland's detailed development plan as well as various State permits; 2 to 3 years of sinking vertical shafts 2,000 feet to gain access to the oil shale; and 1 to 3 years of underground development and demonstration. This leads to our 1981 estimate of commercial production from this tract. Any permit delay would further delay the overall program.

I cite these facts to emphasize the leadtime requirements for a commercial oil shale venture. Do not believe, however, that this long leadtime is peculiar to oil shale. New coal mines take 5 years from planning to commercial production; offshore oilfields, 5 to 7 years; nuclear powerplants, 8 to 10 years; and so on. The point is that we must develop a sense of urgency now to develop our energy supplies for the years to come.

Despite the need, efforts to make land available have been slow and cumbersome, but educational. Perhaps as a result of this experience, we can make major program improvements that will reduce what is probably the longest leadtime item; that of making the land available for development with realistic and environmental sound stipulations.

Probably the major reason for the slow pace of the leasing program has been the fact that there has been no sense of urgency, no high priority assigned to this program. As a result, the resources applied to conduct the program have been inadequate. The program was conceived in 1969, but the first lease was not until 1974. When the last lease sale was held in June 1974, it was apparent that all the winning bidders planned to utilize surface retorting techniques. The Department of Interior set about to lease two additional tracts and announced in the spring of 1975 that these sites would be put up for bid in June 1976.

Oxy protested vigorously at that time that 15 months was more time than was needed for the leasing process. A number of suggestions were made for shortening this lead time, but none of them were accepted. When June of 1976 came and went without the promised lease sale being carried out, a new target of late 1977 was set. If the United States is ever to have a significant shale oil industry, this kind of performance must be corrected. Specifically, it is recommended that:

The Department of the Interior move vigorously to complete the present leasing program, with lease sales in 1977, as early as possible.

The Department of the Interior identify at least 10 sites in Colorado and 5 sites in Utah on which future lease sales will be held.

That a maximum effort be devoted to preparing environmental impact statements for these sites. Sufficient resources should be applied to this effort so that it can be completed in 6 months' time.

That the Federal Government collect all the baseline environmental, hydrological, and geological data on these sites with the cost of this collection being added to the sale price of any leases subsequently sold. This one step could reduce development time by 2 years.

That bidding rules be revised to remove front-end payments providing that bonus or royalty payments will be made out of production. Provisions can be included which will insure diligence by a successful bidder.

There is an additional problem which falls under the jurisdiction of another committee, but unless it is solved it will delay and could even prevent oil shale development. It is the question of air quality that exists today on the lease sites. The lease holders of both Colorado tracts, C–a and C–b, with their environmental monitoring equipment, have detected natural background conditions which at times exceed existing standards. At the request of the Secretary of Interior, the Environmental Protection Agency is reviewing regulations and pro-

cedures to determine whether legislative action will be required to change the regulations and allow construction of oil shale facilities. It is urged that the oil shale region be designated a class II area, which would relieve at least one aspect of this regulatory problems.

The economy of the United States is tied to liquid fuels, and will be for at least the next 20 to 25 years. At present, the only significant source of liquid fuels is petroleum. With each passing month, we are becoming more and more dependent on the OPEC nations for our petroleum supplies. Oil is a grave threat to our national security. This is true both as to quality and price. Shale oil could be produced at a price competitive with that of new oil today. Production on a single 5,000 acre tract, fully developed, could reach 200,000 barrels a day.

I urge this committee to press for the actions I have recommended.

Senator METCALF. Thank you very much for a splendid statement. I am impressed by what your company is doing, has done, and by some of the optimism you have shown in future development of this great resource.

Mr. BAEDER. Thank you.

Senator METCALF. Some of these things, of course, that you outline will have to have legislation. I assure you that this committee, and Chairman Jackson, are much concerned about moving legislation forward. I am, at his request, going to have this subcommittee do everything we can to meet some of the deadlines that you mentioned. Some of the things that you point out have been the result of the Department of Interior, and I hope that we can work with them in urging them to go forward to help you work out some deadlines. Of course, some of these things you are working out with ERDA for some leasing right now. I know Mr. White is here and we share the same concern in trying to move forward in this important area.

Thank you.

Senator METCALF. I am going to welcome you, Mr. Hoertz, and then I will turn you over to Mr. Harvey. Mr, Hoertz, we are glad to hear about the negotiations between Ashland and Occidental and we feel that they started right in November. What did you do, start the day after the election?

Mr. HOERTZ. Just about.

Senator METCALF. It sounds as if you did, anyway. We would like to hear from you now. Then we will talk to you together.

STATEMENT OF CHARLES D. HOERTZ, JR., MANAGER, SYNTHETIC FUELS DEPARTMENT, ASHLAND OIL CO.

Mr. HOERTZ. My name is Charles Hoertz, and I am Manager of the Synthetic Oil Department for Ashland Oil, Inc. I am pleased to have the opportunity to appear before the Subcommittee on Minerals, Materials and Fuels.

Ashland Oil is now the sole surviving lessee of tract C–b, one of the four tracts awarded under the Federal oil shale prototype lease program. Ashland, along with ARCO, TOSCO and Shell Oil acquired the lease in February 1974, with a high bonus bid of $117.8 million. Since then, the group has made three of the five bonus installment pay-

ments totaling $70 million and spent an additional $20 million gathering environmental baseline data, carrying out confirmation studies on the geology and hydrology of the tract and preparing a detailed development plan, all in accordance with the provisions of the lease. These have been sizeable expenditures by almost any standard but, unfortunately, they have not taken us one step closer to commercial development of the tract than we were the day we received the lease.

In February 1974, there was a sense of urgency in the air as a result of the oil embargo and a certain momentum had started to build for a national energy policy that would support development of synthetic fuels. This feeling has since disappeared and the incentive for industry to commit to such capital intensive development has also declined. As a result many projects have been shelved and, particularly, our partners in the C–b tract have chosen to abandon their position in the lease. ARCO and TOSCO withdrew in December of 1975 and Shell took similar action just 3 weeks ago.

One should not conclude from the actions of these companies that the abandonment resulted somehow from any shortcomings in the prototype lease program. Although all the considerations behind their actions are now known to Ashland, it should be pointed out that a similar decision was made by the same group of companies in September of 1974. At that time the privately oriented Colony project, which would have been the Nation's first commercial oil shale plant, was indefinitely suspended, primarily because of political environmental, and economic obstacles. Those factors have still not been resolved and in our opinion are responsible for the condition of today's oil shale program.

In spite of these obstacles, however, Ashland still views the prototype lease program as viable and is taking steps to revive the C–b project. Just recently we have entered into an agreement with Occidental Petroleum Co., whereby Oxy will become a partner in the lease for the purpose of developing the tract with Oxy's modified in situ technology. This decision was made as a result of a preliminary study that has confirmed substantial advantages for the Oxy process, particularly in the area of resource recovery and environmental protection. We are now proceeding diligently with a change of operating management and with the necessary changes in the detailed development plan, approval of which must precede tract development. The lease, of course, is currently under suspension until September 1, 1977, so any field activities will be delayed until at least that date.

It is expected that about 2 months will be needed to incorporate the use of the Oxy process into the detailed development plan. The original plan, which was submitted last February, was based on underground room and pillar mining with surface retorting using the TOSCO II technology. With the latter approach, it is estimated that recovery of oil from the C–b tract would be limited to 350 million barrels, or below the level believed necessary to support commercial development. The new plan has the potential of increasing the recovery by at least a factor of 3 or to 1 billion barrels, and with less environmental impact.

Assuming the modifications of the detailed development plan can be submitted to the area oil shale supervisor by mid-February of 1977, it would seem probable that approval could be given on or be-

fore the current 12 months suspension is terminated. Based on this schedule, it is contemplated that the field development related to shaft sinking activities could be initiated during the fall of 1977. The plan will probably call for some type of modular development proceeding concurrently with the installation of the major shafts. This would allow a limited commercial scale operation to be evaluated before final commitment to full commercialization. A reasonable schedule for the project is estimated to bring 50,000 barrels per day production on stream by 1985. This is more conservative than Mr. Baeder, but it is the other end of the range he was giving.

What has just been described could be considered as the base case for development of tract C–b. It is contemplated that after sufficient experience has been gained with the Oxy process that a production rate as high as 100,000 barrels per day could be accommodated by the tract. In addition, the recovery of oil from the shale mined in the process of creating the underground retorts would increase production by another 20,000 to 40,000 barrels per day, thus leading to more than 120,000 barrels per day from tract C–b. Preliminary studies have indicated that optimum economics and maximum recovery of the resource are reached through such a combination of retorting techniques.

Although the contemplated plan for developing tract C–b looks quite promising, there are geological and hydrological risks which will only be resolved once the mine is developed. Furthermore, tract C–b conditions are sufficiently different from the area where the Oxy process has been developed that certain risks are inherent in transferring the technology. Although oil shale development must be considered a high risk venture, the tremendous quantities of shale oil which could be produced from this resource justify proceeding with the project. Decisions relative to the technical risks will be evaluated at each step of development as the actual conditions are encountered.

With regard to the lease program, Ashland believes it is a logical step in defining the viability of an oil shale industry. It was accepted by industry from the beginning and its basic advantages are still apparent. There does not seem to be any question about whether the Nation needs to develop its indigenous resources, but rather can it be done in an environmentally acceptable manner and at a price that will permit development by the private sector. The prototype program is specifically structured to answer these questions in an orderly manner and provides a real opportunity to design a major new industry from the ground up.

In addition, the prototype program offers another benefit which is particularly important to the timely development of shale. By design, each of the lease tracts will probably require the use of different development techniques. Thus, as a result of the concurrent application of different methods and technologies, the second generation oil shale projects will be able to utilize an unusual amount of experience gained during the prototype program, and can start at a high level on the learning curve. This acceleration of technology development will be absolutely necessary if we are to have any significant production of shale oil by the end of this century.

Throughout this statement reference has been made to obstacles that have confronted oil shale development and the fact that they still exist today. Although Ashland is continuing to give its support to the lease

program, we cannot go forward without the Federal Government and other public institutions as well as the private sector cooperating with us to remove these roadblocks. It is obvious that we cannot continue to spend millions of dollars on nonproductive efforts and at some point soon the way must be clear for meaningful progress. Of prime importance, of course, are economics. Any decision to proceed will depend on a favorable economic climate—either in an improved and free marketplace or through legislative action that will provide incentives to compete in the unstable situation we now have. Congressional attitude in this area has not been productive although there were encouraging signs during the final stages of the past session when the House was considering the synthetic fuels bill H.R. 12112.

In addition to the lack of positive action by Congress and by others, we are equally disturbed by the continuing efforts of factions within Congress to enact legislation which would effectively preclude Ashland from proceeding with oil shale development. I am referring to efforts made in the 94th Congress to amend the Clean Air Act so as to place such restrictive environmental controls on industry that not even one oil shale plant could confidently be expected to operate in full compliance with the regulations. Such extreme environmental restrictions at this stage are in direct contradiction to the goals of the prototype lease program. Another disturbing issue which tends to preclude Ashland or any other oil company from making further commitments to oil shale is the matter of horizontal divestiture. In our opinion this would deal a severe blow to oil shale for without oil industry capabilities and experience, there will be little hope for the lease program or any commercialization in the foreseeable future.

We do believe, however, that these negative factors can be alleviated by good communication and reasonable compromise between the concerned groups and Ashland wants to cooperate in every way possible to bring about accord. Attainment of the goals of the lease program would be an essential step toward preserving the economic and social stability of the Nation and we should all be prepared to work together to see that they are achieved.

Senator METCALF. I will give you my personal assurance, and I think I can give you the assurance of this committee, that we want to cooperate in the way that you have described in developing this resource. We had various problems at the close of the last session of Congress that were not just the result of lack of desire to handle this situation, but we just didn't have the time that we needed and I know that the chairman of this committee and I as chairman of the subcommittee, potentially chairman, will have a high and urgent priority on these matters.

You talk about congressional proposals to change the Clean Air Act. Can you operate under the current Clean Air Act? I am going to ask both of you, Mr. Baeder and Mr. Hoertz. First Mr. Hoertz.

Mr. HOERTZ. Our evaluation of the situation in the first detailed development plan that we submitted was that we could, that at least one plant could be built.

Senator METCALF. Mr. Baeder.

Mr. BAEDER. First of all, let me say we are operating in compliance with the Clean Air Act. In the 4 years we have been there we have had no citations for any air or water quality problem. We fully antic-

ipate that on the C–b we will be able to operate in compliance with the Clean Air Act. We are concerned about the periodic level of non-methane hydrocarbons which exceed the standard. We have not identified the source. They exist on the C–b property, but not on the property we are currently operating. We feel they are due to blow-downs from gasfields which are in the vicinity of the C–b property. Certainly, we will be making studies, to get some correlations between these periodic high levels and various operations in the area there. They shouldn't be there. It is out in the country. I see no real reason for that area to have those heavy levels of emissions and I think we can find out what the source is and hopefully eliminate it. Our estimate is that we should be able to operate within the clean air standards, yes, as they now exist.

Mr. HOERTZ. I think there is one exception and that has to do with fugitive dust. The current regulations for particulate matter are sometimes exceeded just by the natural occurrence of fugitive dust and, of course, that makes it impossible to operate within the regulations.

Senator METCALF. Many years ago I was a member of the Montana State Legislature and in those days there was always a bill introduced in the State legislature, to control silicosis in the underground mines of the Anaconda Co. and every 2 years the Anaconda Co. came in and told us there was more danger of silicosis in the rural areas from heavy dust than there was danger in their mines as far as hard rock mining was concerned. We no longer have that allegation made, and, of course, we have Federal legislation now.

Mr. BAEDER. We are very hopeful that an enlightened Congress will recognize that we can't do anything about the dust that is blowing in the area. I think we can do a lot to keep from adding to the particulates and in situ in this regard is going to be good from that point of view.

Mr. HARVEY. Let me just propound some of these questions that we asked before. What price for crude oil do you think is necessary to make your operation economically viable?

Mr. BAEDER. Before giving you——

Mr. HARVEY. You referred to the current price.

Mr. BAEDER. I do want to caution you these are estimates based on engineering and economic studies. They are more than preliminary, but they are not as detailed as one would like at this stage. Nonetheless, I believe they are of sufficient quality for our company to be willing to put many more millions of dollars into this development. These estimates indicate that we could produce oil, competitive with today's imports at today's prices and earn a 15-percent return on our investment.

Mr. HOERTZ. Let me add to that. I took a more conservative approach in looking at the project and came to the same conclusion that we could be competitive at today's prices for the market crude oil.

Mr. HARVEY. Have either or both of you analyzed your estimated cost for the environmental quality control and water pollution?

Mr. BAEDER. Yes; the mitigation techniques have been thoroughly analyzed and in all cases we were using proven technologies.

Mr. HARVEY. You could meet existing standards with the exception of the ambient air quality?

Mr. BAEDER. Yes; these are included in the investment and they are reliable technology. I could also mention to you in this regard that in the investment numbers that I have quoted there is roughly about 8 percent of that total investment being set aside for socioeconomic development, many millions of dollars to help in the location of individuals that would be brought in for both the construction and operation. This has not been ignored in giving you the cost that we mentioned.

Mr. HARVEY. Can you give us the number?

Mr. BAEDER. The total investment?

Mr. HARVEY. How much would the air and water quality control cost?

Mr. BAEDER. I am pulling from memory now. I believe in a 50,000-barrel-per-day facility which we estimate to be somewhere between $300 million and $400 million, we have roughly $30 million set aside for water, reclamation, purification, and use. There is another $15 million to $20 million in there for air clean up. An additional $20 million for socioeconomic development.

Mr. HARVEY. Thank you. You both indicated that you were going to submit this revised development plan fairly early next year. I assume that proposes using above ground retort?

Mr. BAEDER. No.

Mr. HOERTZ. That would not. This is contemplated later on. Our first action will be toward the use of the modified.

Mr. HARVEY. You will not be retorting anything above ground in that process?

Mr. BAEDER. No.

Mr. HOERTZ. Not in this immediate plan.

Mr. BAEDER. I might elaborate on that because at least from Occidental's point of view, we have always looked on the disposal of the spent shale as a problem that we had not yet dealt with, in sufficient detail. We felt that the disposal of raw rock, which, as you could see from those slides that we showed you, look like normal rock trailing down the side of the canyon, presented no serious environmental problem. We would intend to start with a minimal environmental impact. Dr. Hoertz has mentioned that there is going to be strong economic and resource pressure for retorting it because it is perfectly retortable rock. But when you retort this above ground one has to deal then with the disposal of spent shale rather than raw rock which introduces another problem. It is not necessary for the economics at this point to do so.

Mr. HARVEY. The Department witness indicated, and I think Dr. White also felt the same thing, that they felt industry had been retarded because of the uncertainty of the loan guarantee program. Do you agree with that view?

Mr. BAEDER. No; but I am speaking only for myself now. Our program has not fluctuated one iota wondering what would happen in the loan guarantee program. A long time ago we said if shale is going to be good for this country it has to stand on its own two feet. We have not built a program that was going to depend initially on loan guarantee programs.

Mr. HOERTZ. On tract C–b we had not anticipated any loan program having an impact. I would say it did have an impact on the pilot project we rant at Colony.

Mr. HARVEY. Has the availability of the ERDA funding which you have applied for made a difference?

Mr. BAEDER. Let me just state for you briefly what our policy is on ERDA funding. We believe that ERDA can play a very important role in advancing the technology. What you have got to appreciate is that the technology that we are developing when viewed 20 years from now, will be primitive. Every new industry generally comes in with primitive technology and major advances are made with that technology in its early years. I think ERDA has the foresight to see this and says we can help accelerate the development of this industry by finding and demonstrating advanced technology, the basis of our discussions with them, and it is the basis of their Program Opportunity Notice. Hopefully the contract we will sign with them can be instrumental in accelerating the full development of this industry.

Mr. HARVEY. You made reference with respect to the ERDA proposal, that there was a hint there of some concern over the reasonableness of ERDA and the protection of your proprietary position.

Mr. BAEDER. It is a concern to us, because we have put in $45 million of what I call "up-front pioneering money," that has earned us a proprietary position, well protected by patents and know-how, and we are very anxious not to lose that position. We don't believe that working with ERDA will necessarily threaten that, and I just think it is too early to comment on it in any other way. We don't believe that it will or should.

Mr. HARVEY. You mentioned at the end of your statement, Dr. Hoertz, on the economics of the situation that you needed a more favorable climate. The words "free market"—do they imply the dissolution of OPEC?

Mr. HOERTZ. No; what I meant was that right now we have an unstable situation, crude oil in this country is controlled by certain legislative action, foreign crude oil is controlled by other governments and it is not necessarily free. It is at the disposition of political entities.

Mr. HARVEY. Then it would imply the dissolution of OPEC to get to the free marketplace. I am trying to see what your conditions are.

Mr. HOERTZ. I really feel like in talking about OPEC I don't think it will lower the price. Someone brought this up earlier, that there is concern that they could lower the price to keep other alternative energy sources from being developed. I don't feel that is the case, but I do feel there is enough political influence in the price that it tends away from a free marketplace.

Senator METCALF. What you are saying is that if oil prices, domestic oil prices, were decontrolled that would be a free marketplace?

Mr. HOERTZ. Definitely.

Senator METCALF. With OPEC still in existence?

Mr. HOERTZ. Yes; that would be a big step forward.

Mr. HARVEY. You don't think the fact that we import a sizable percentage from OPEC would have any influence on the marketplace here?

Mr. HOERTZ. Yes; I think they are going to have a lot of influence.

Mr. HARVEY. You said either through the free market price or through legislative actions to provide incentives. You indicated you

were not holding back because of the absence of the loan guarantee programs. What were the other incentives you had in mind?

Mr. HOERTZ. I think the guaranteed loan program is a good one. I think that certain tax incentives could be helpful but I didn't intend to get into any discussion about what specific incentives there are. I think our big concern is that we are faced with right now control of prices in the United States and certainly we cannot compete with those crude oil prices. We think we can compete with foreign oil as it is now priced and being delivered to this country and $7 or $8 crude oil as it is controlled today is certainly out of the question and if we did have to compete with that, it would certainly take some sort of incentive to improve the economics.

Senator METCALF. Thank you both, thank you Mr. Ridley, for coming here this morning, for telling us about some of the progress that you have made, and again I want to renew my assurances that you are going to have the cooperation of this committee as far as necessary congressional action is concerned and we will work with you, and hope to get the same kind of cooperation from the other end of the stream. It was a very worthwhile morning for me and I know your testimony will be examined. As I said to the others, we will look forward to seeing you early after we get our Committee reorganized and underway in the next Congress.

Thank you all. I want to thank everybody for coming this morning and helping us in this preliminary discussion.

We will adjourn subject to the call of the Chair.

[Whereupon, at 12:20 p.m., the hearing adjourned, subject to the call of the Chair.]

APPENDIXES

Appendix I

Department of the Interior's Responses to Questions Submitted by Senator Metcalf Together with Notices of Suspension of Operations

U.S. DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., November 22, 1976.

Hon. LEE METCALF,
Chairman, Subcommittee on Minerals, Materials and Fuels, Washington, D.C.

DEAR SENATOR METCALF: This is in further response to your letter and questions of September 24 on oil shale. Enclosed are the Department's responses to your questions along with a copy of the Notices of Suspension for tracts U-a and U-b. Please contact us should you or your staff need additional information.

Sincerely yours,

CHRIS FARRAND,
Deputy Assistant Secretary of the Interior.

Enclosures.

Question 2. Explain what provisions were contained within the lease for Tracts C-a and C-b to ensure timely development of the leases, and how the Department now considers those requirements for timely development will be enforced under the conditions of suspension of these leases.

Answer. The oil shale lease requires that production in commercial quantities be reached by the twentieth lease year for renewal of the lease. Minimum royalties under the lease terms escalate starting from the sixth lease year and reaching the maximum in the fifteenth lease year. Upon approval of Detailed Development Plans, the required schedule of all operations to develop the lease set out in that plan becomes binding on the lessee. Incentives for timely development are provided in the lease in the form of offsets to bonus payments and royalties. The notices of suspension include a list of conditions which the lessees must meet. These conditions are aimed at providing the information which will allow the lifting of the suspensions, as well as, continuation of baseline data collection and initiation of an interim environmental monitoring program. Upon termination of suspension of operations, both the diligence requirements and incentives become effective again.

Question 3. Explain the manner in which the Department, in granting suspension of the C-a and C-b leases has calculated the opportunity costs of tying up prime oil shale leases for a year while the lessees decide whether or not to proceed with development of the leases.

Answer. The question implies that the lessees are "tying up" the oil and shale deposits and precluding other interested individuals or companies from developing oil shale. So far as we know this is not the case. Furthermore, the reasons for not proceeding with lease development would be experienced by anyone (including a Federal Corporation) who attempted to develop the oil shale tracts. The major "opportunity cost" would be the cost associated with any attempt to develop oil shale even though air quality regulations preclude such development. There may be some cost associated with our delay in establishing the time cost of shale oil, since such a price could likely set the ceiling price for imported oil.

Question 4. What will be the Department's response if, at the end of the suspension period, lessees of tracts C-a and C-b request extension on grounds that major uncertainties remain unresolved?

Answer. Whether or not the Department extends the present suspensions will depend on: (1) results of air quality studies currently being made by EPA, (2) legislative outlook for off-site legislation, (3) results of certain technical analyses being made by lessees, and (4) the outlook for resolving these issues within a reasonable period of time. Since the leases were not suspended because of economic reasons, we will not extend the suspensions because of economic uncertainties.

Question 5. How long is the Department prepared to reserve this important public resource for the exclusive use of lessees who have so thoroughly documented their inability to develop the leases in the manner proposed in their Detailed Development Plans?

Answer. In granting a suspension of operations for the oil shale leases, the Department did not simply approve the lessees' applications; a separate notice

of suspension was signed by the parties. The issues recognized by the Department as valid for granting a suspension were that environmental baseline data has shown for all four tracts that during intermittent periods natural background levels of certain air pollutants exceed current Federal clean air standards. In addition, for Tract C–a, there is no current authority for granting off-tract disposal which constrains efficient mineral recovery as originally contemplated. For Tract C–b, rock strength problems have been discovered which could significantly affect resource recovery. The suspension granted for these reasons is for a period of one year. Even though the suspension may be extended depending on the solution of these problems, the Department does not view a suspension of operations on the oil shale tracts to be a long-term situation.

As to your allegation that the lessees have so "thoroughly documented their inability to develop the leases" we don't know what the basis of your statement is, but we understand that many of the reasons for the lessees' inability to proceed are due to circumstances over which they have no control. We certainly welcome your suggestions on how the rock strength and air quality problems can be overcome.

Question 6. Although the Department has based its grant of suspension on Sec. 39 of the Mineral Leasing Act, the lessees of tracts C–a and C–b have cited major economic impediments, such as pride controls on crude oil and petroleum products and the lack of investment tax credits to "help ease the financial burden." Such economic factors may actually be the main reason for lessee's application for suspension and if so, would they be regarded by the Department as good reason for suspension?

Answer. Section 39 of the Mineral Leasing Act, as amended (30 U.S.C. § 209), provides for the waiver, suspension, or reduction of rental and minimum royalty and the reduction of royalty for the purpose of encouraging the greatest ultimate recovery of the mineral and in the interest of conservation of natural resources. Section 39 also provides for a suspension of operations and production in the interest of conservation. Section 39 does not authorize the suspension of operations for economic reasons.

Question 7. Which specific operations are affected by the grant of suspension on Tracts C–a and C–b?

Answer. All operations are affected by the suspension of operations except those specifically required under the notice of suspension. Operations pursuant to approved exploration plans and operations pursuant to Detailed Development Plans when approved are affected.

Generally, the notices of suspension require the lessees to complete the two-year Baseline Data Collection Program, implement an interim environment monitoring program, and certain other ongoing studies including rock mechanics and revegetation research.

Question 8. What is the earliest date, according to the Detailed Development Plans submitted by the lessees, on which actual operations would occur on Tracts C–a and C–b?

Answer. The Detailed Development Plans state that for Tract C–a construction would commence for phase one in April of 1977; operation of phase one facilities would commence in August of 1979. For Tract C–b, construction of phase one would commence one year after approval of Detailed Development Plans; operation of phase one facilities would commence 3 years after approval These dates will likely be set back because of the 1-year lease suspensions.

Question 9. How will the suspensions affect payment of bonuses by lessees of Tracts C–a and C–b?

Answer. The effect of a suspension of operations on bonus payments is set out in lease Section 22.5 and 1(d) and consists of delaying for the period of suspension the decision on the fourth and fifth bonus payments. After the suspension is lifted the lessees options are; to pay the bonus to the Government, offset the bonus payments with expenditures made for the development of the lease tract, or to relinquish the lease and be relieved of the fourth and fifth payment obligation.

Question No. 10. Has the Department conducted any review of the cost estimates for various types of oil shale development technology so as to be in a position to know (within a margin of error) what methods should be encouraged for any future leasing? If so, please provide the results of that study.

Answer. The Department maintains an awareness of the cost aspects of the various types of oil shale development technology as they become available and

as the technologies evolve. However, no review of cost estimates for various types of technology has been made for the purpose of determining what methods should be encouraged in any future leasing. It would be premature now to make such a determination. By the time additional leasing (beyond the prototype program) is to be considered, much more technological development and experience should have taken place, providing a basis for cost estimates that will be meaningful at that time.

In assessing technology to be encouraged in future leasing, there will be important considerations in addition to cost estimates. Among these are resource utilization, environmental impacts, and a determination of which technology best suits a particular area or part of the formation. For example, no single mining method will suffice for all the richer oil shale deposits of the Green River Formation because of the diversity of geologic, hydrologic, topographic and other conditions from one area of the formation to another. One important objective of the prototype leasing program is to obtain experience on several technologies including several mining methods, and in situ processing, as well as conventional oil shale retorting.

A tabulation of preliminary estimates of capital and operating costs as of 1974 (but now obsolete) for several types of oil shale development technology is presented in the 1974 Project Independence Oil Shale Task Force report, page 65. Also included in that tabulation are estimates of requirements for manpower and steel. Those cost estimates were based on the information the Department had at that time and the economic conditions existing then. They would not be suitable for the purposes suggested by question number 10, but may be of interest to the Subcommittee.

In an initial phase of the current oil shale mining research program, the Bureau of Mines has contracted for technical and economic studies of underground and open pit mining of deep oil shale deposits and of an underground mining, rubblization and in situ retorting system for deep oil shale deposits. The studies are nearing final stages. Studies such as these plus the experience to be gained from field research projects and from the prototype lease projects are expected to provide both cost and technologic information that can be used advantageously in shaping any future oil shale leasing program.

Question 11. Assuming that cost factors are deemed to be a valid reason for suspending leases—whether openly acknowledged or not—which categories of cost are judged by the Department to be controlling?

Answer. The Department does not consider cost factors by themselves to be valid reasons for suspension of operations on oil shale lease tracts, and therefore, has not evaluated various categories of costs with respect to suspension of operations.

Question 12. According to an article in the Denver Post, Under Secretary Kent Frizzell was quoted as saying that oil shale is too costly to develop, putting the per-barrel figure at $28, or twice the cost of imported oil. If he was correctly quoted, does Mr. Frizzell's comments indicate that the Department is prepared to accept at face value the sharp increase in cost estimates now being cited by the industry? Please explain.

Answer. Your question does not accurately reflect the actual statement which Under Secretary Frizzell made. The Under Secretary did not say "Oil shale is too costly to develop," or that the "price per barrel was $28." What the Under Secretary said was, "There are two problems attendant to oil shale production—price and water." The Under Secretary went on to say that, "Depending on who you talk to, the price per barrel of oil from oil shale could be from $18 to $28 per barrel." As we have told your committee many times, it is not possible to realistically determine, on a priori basis, the final selling price required for shale oil. The Under Secretary was simply quoting a range that some in industry have given to the Department.

Question 13. Mr. Frizzell was also quoted as stating that the volume of water needed to support large scale production with current technology is another major problem facing oil shale development. In this regard, what consideration has the Department given to technology developed by the Superior Oil Company which reportedly requires no withdrawals from local water supplies and is said to result in a net contribution of potable water to local streams?

Answer. The Department has considered the Superior approach which is especially applicable to areas where high concentration of nahcolite and dawsonite are associated with the oil shale. At the present time the Department is preparing

an environmental impact statement on an exchange application of Superior Oil Company.

Question 14. Superior Oil Company has claimed that its multi-mineral process is the answer to the high cost of oil shale development. An Oil Daily article recently quoted Ben Weichman, manager of Superior's oil shale department as saying, "Anyone who is saying the oil shale outlook is dim just isn't looking at the whole picture." Is there any reason why this approach could not be adopted in the Department's prototype program?

Answer. The Superior process is best applied to oil shale areas with high saline concentrations. The existing lease sites are, therefore, not that well suited to this approach. Superior Oil has not asked the Department for a lease nor were they an active participant in the leasing process. As stated in the answer to Question 13, the Department is actively preparing an EIS pursuant to an exchange application of Superior Oil.

Question 15. Occidental Oil Company claims to have produced an in situ technology which promises to reduce drastically many of the costs associated with the approaches advocated by lessees of Tracts C-a and C-b. What is the Department's assessment of that possibility?

Answer. The Department of the Interior is not privy to Occidental's technical or economic data. The Department has, through the Bureau of Mines, had a contract with Finix and Scission to do a "Technical and Economic Study of the Modified In Situ Process for Oil Shale." The final report is scheduled to be available shortly.

On November 3, Ashland Oil announced that Occidental Petroleum Corporation will acquire a 50-percent interest in oil shale lease tract C-b. The group plans to use Occidental's proprietary, modified *in situ* technology. The Department expects to receive a modification to the Detailed Development Plan, which will provide us with more information about the technology Occidental hopes to use.

Question 16. What is the current status of the Department's selection of two additional tracts for in situ development?

Answer. The Department through the Geological Survey is in the process of preparing a Supplymentary Environmental Impact Statement prior to selection of two lease tracts to be developed by in situ methods. The statement is scheduled to be completed in August of 1977.

Question 17. Please respond to the possibility that lessees of Tract C-a, C-b, U-a, and U-b were not seriously interested in oil shale development because their winning bids were predicated on what they would now have us believe were false assumptions, but assumptions nonetheless which they could have checked out—such as the assumption that air quality standards would not prove excessively stringent?

Answer. Although it is impossible to know everything which all persons at the time assumed or did not assume, two facts speak against the allegation of this question. The size of the bonus bid (even the three payments made ot date) on each lease and the documented intentions on the part of the lessees to offset all of the fourth and fifth payments leads to the conclusion that the lessees were and are serious about developing oil shale. With regard to air quality standards, the leases were issued between February and May of 1974. The National Ambient Air Quality Standards were in effect at that time, but it was not known that the existing ambient air quality in the Piceance and Unitah Basins exceeded these standards until the lessees' baseline data collection programs provided actual measurements. Such air quality monitoring had not been previously conducted in these areas. Additionally, both the Federal nonsignificant deterioration standards and the Colorado Revised Sulfur Dioxide Standards only became effective after the leases were sold. So it was impossible for the lessees or the Department to know what effect these standards would have. We will not be able to determine whether this issue can be resolved administratively until certain EPA studies have been completed.

Question 18. What is the status of the negotiations going on between the Department and Superior Oil Company for an exchange of land needed for oil shale development?

Answer. Superior Oil has submitted a preliminary description of the proposed project. We are now awaiting further information on their project proposal and beginning work on an EIS. Our target date for preparation of the EIS is fiscal year 1978.

Question 19. In his statment of March 17, 1976, made before the Senate Subcommittee on Minerals, Materials, and Fuels, Assistant Secretary Jack Horton

said, "In our judgment, no real effort to develop a prototype commercial oil shale operation will take place until the pricing matter has been clarified." Is this still the view of the Department?

Answer. From the context of your question you have apparently misunderstood what pricing issue Assistant Secretary Horton was referring to. The Assistant Secretary was not referring to the costs of developing oil shale but rather was referring to the uncertainty, at the time, over the applicability of crude oil price controls to shale oil. On February 13, of this year, the Department requested the FEA to determine whether or not price controls for crude oil under the EPAA would apply to synthetic shale oil. On June 17, 1976, FEA issued Ruling 1976–4 which in effect held that shale oil does not fall within the purview of FEA's authority to establish mandatory petroleum allocation and price regulations under authority to the Emergency Allocation Act as amended. Since this issue has been resolved there is no longer any uncertainty on the part of lessees over this pricing issue.

Question 20. Was an Environmental Impact Statement ever prepared on the application for suspension of tracts C–a and C–b or tracts U–a and U–b? If so, please provide a copy.

Answer. We have considered this matter and concluded that the temporary suspension of the oil shale leases does not constitute a Federal action for which an EIS must be prepared under the National Environmental Policy Act. The suspension does not entail any new consequences which have not been already considered in the Prototype Oil Shale EIS published by the Department in August 1973.

Question 21. If not, explain why none was prepared and supply any relevant memoranda.

Answer. See answer to Question 20.

Question 22. Has the Department prepared Environmental Impact Statements in other similar instances, as for example on the suspension of OCS leases?

Answer. The Department has not prepared EIS's on lease suspensions. In the Santa Barbra case, OCS oil and gas leases were suspended and several EIS's were prepared. However, the EIS's were on such things as exploratory drilling, not on the question of suspension. In fact, if it would have been necessary to prepare an EIS on the suspension itself, the environmental impacts would have continued until the EIS was completed in a year's time.

Question 23. If so, please explain the circumstances.

Answer. See answer to Question 22.

Question 24. Has the Department, either with or without preparing an Environmental Impact Statement, examined the alternative of cancelling the leases for Tracts C–a and C–b? Please explain in any case.

Answer. The Department has no cause to cancel the leases, as there have been no violations of lease terms, nor has there been any request to cancel the lease. The lessees have complied with all terms of the lease in operations to date.

Question 25. Were there other possible alternatives to suspension which were considered by the Department? If so, what were they?

Answer. The only viable alternatives to granting a suspension of operations once applied for would be to deny the application. In their suspension applications the lessees identified valid reasons for granting suspensions.

Question 26. According to a letter from Acting Secretary Gregory Austin to Senator Metcalf, dated August 20, 1976, the Department's ratoinale for granting suspensions of leases for tracts C–a and C–b is based upon a broad reading of the Secretary's powers under Sec. 39 of the Mineral Leasing Act; specifically, the term 'conservation of resources" is interpreted to include conservation of environmental as well as mineral resources. What is the basis for this interpretation?

Answer. There has not been an actual case interpreting the term "conservation of natural resources" in Section 39 of the Mineral Leasing Act as including the conservation of nonmineral resources, but the Secretary's authority to issue suspensions in the interest of conservation under Section 5(a)(1) of the Outer Continental Shelf Lands (OCS) Act (43 U.S.C. § 1334(a)(1)) was interpreted in *Gulf Oil Corp.* v. *Morton*, 493. F. 2d 141 (9th Cir. 1973, 1974), as embracing the authority to suspend operations in the interest of conservation of all natural resources, not merely the oil and gas subject to the lease. The provision in section 5(a)(1) is similar to that in Section 39, and the legislative history of the OCS Act reveals that the provisions of Section 5(a)(1) were based in part on Section

39. We rely upon the *Gulf* case as supporting, by analogy, our interpretation of Section 39.

Question 27. Is it true that the air quality standards of which the lessees in both instances complain, were in effect at the time bidding on the leases occurred, and that the lessees were aware of lease stipulations requiring compliance with applicable air quality standards?

Answer. The National Ambient Air Quality Standards (NAAQS) were in effect at the time bids were submitted, but it was not known that the existing ambient air quality in the Piceance and Uintah Basins exceeded the NAAQS until the baseline data collection programs provided actual measurements. Such air quality monitoring had not been previously conducted in the Piceance—Uintah Basin area. In addition, the EPA's "no significant deterioration" regulations were not promulgated until December 5, 1974, eight months after the last successful oil shale lease sale. And more recently, the State of Colorado redesignated areas under the State's clean air regulations.

Question 28. If so, why is the Department giving credibility to the argument that suspension should be granted because the air quality standards are overly stringent?

Answer. The existing ambient air quality levels of non-methane hydrocarbons, ozone and particulates under certain meteorological condtions exceed levels allowed by the NAAQS. Therefore, no new emission sources can be allowed under these standards. In other words, the fact that baseline air quality levels exceed the NAAQS may prohibit any development within this area. The EPA is currently analyzing the relationships between certain of these pollutants to determine whether aditional sources will materially increase air quality problems.

Question 29. What is the status of studiese lessees state are being undertaken by EPA on resolving the air quality standards issue? Please supply any comments or reports by EPA on this matter.

Answer. The EPA is analyzing the relationship beetween hydrocarbons and nitrogen oxides in oxidant formation to reassess whether additional hydrocarbon sources in areas of extremely low NO_x levels do, in fact, materially increase air quality standards problems. We do not know when these studies will be completed and a report by EPA issued.

Question 30. Having now established the precedent of suspending leases on the grounds of air quality standards, is the Department prepared to follow suit in the case of tracts U-a and U-b?

Answer. On September 27, 1976, the lessees of tracts U-a and U-b submitted a new application for suspension of operations. The application essentially raises the same air quality issues which the other lessees identified. Pursuant to this application, the Area Oil Shale Supervisor issued a Notice of Suspension which suspends the leases for a one year period, effective November 1, and conditioned upon the maintenance of certain monitoring programs and continuation of certain studies.

Question 31. What is the status of the application of the Rio Blanco Board of Commissioners (mentioned in the suspension application of Tract C-a lessees) for the redesignation of the area to Category II?

Answer. The Rio Blanco County Commissioners have requested that the Colorado Air Pollution Control Commission consider the redesignation of Rio Blanco County from an SO_2 Category I classification to a Category II classification. The category designation refers to a state sulfur dioxide standard and should not be confused with the Federal significant deterioration Class I, II and III designation. The public hearings on this request are scheduled for February of 1977, in Meeker and Denver.

Question 32. Has the Department concluded that redesignation to Category II would solve the problem? Please explain.

Answer. Diffusion model projections performed to date indicate that redesignation of Rio Blanco County to the State SO_2 Category II would solve the sulfur dioxide problem. This would not, however, resolve overriding problems of periods when non-methane hydrocarbons, ozone and particulates presently exceed the National Ambient Air Quality Standards.

Question 33. If the air quality problem should be resolved to the satisfaction of the lessees, would the Department feel justified in attempting to terminate suspension of the leases? If not, why not?

Answer. If the air quality problem were to be resolved to the satisfaction of the Department, termination of suspension would be considered. However, other problems in mineral resource recovery must be considered. In the case of C-a

the availability of offsite land use must be resolved. For C-b, the mineability studies must be completed.

Question 34. Has the Department supported lessees' bid for redesignation of the area to Category II? Please explain.

Answer. The Department has not become involved in the redesignation requests. At this time, we have only acted as observers to the proceedings.

Question 35. The Department's notice of suspension for Tract C-b contains a condition requiring lessees to implement additional mineability studies and activities as approved by the Mining Supervisor. Why does the notice of suspension for Tract C-a contain no such stipulation?

Answer. The condition in the Notice of Suspension for Tract C-b requiring mineability studies was deemed necessary in order to implement procedures aimed at identifying a mining system for Tract C-b which will obtain the highest recovery of the resource consistent with the rock characteristics. Further mining studies were not deemed necessary during the suspension period for Tract C-a, because no rock strength problems have been identified which may adversely affect the mineability of the resource. The C-a lessees have identified the optimum resource development methodology, however, this approach cannot be implemented until Congress acts on off-site dispersal legislation.

Question 36. Please explain how the Department expects lessees of Tract C-b to comply with Condtion #4 (mineability stipulation) without engaging in development operations to test the lessees' assumption that the rock formation is structurally weaker than originally anticipated?

Answer. The lessees have entered into a cooperative agreement with the Bureau of Mines to further evaluate the rock mechanics data and study compatible mining methods.

Question 37. What is the schedule for completion of these mineability studies and activities?

Answer. The studies are anticipated to be completed within the suspension period.

Question 38. If lessees of Tract C-b fail to undertake or complete these mineability studies and activities, what will be the response of the Department?

Answer. As the lessees have undertaken the studies through their cooperative agreement with the Bureau of Mines, the first part of the question is moot. Determination of what action might be taken should the lessee fail to complete the studies cannot be made until the status, results, and any additional time requirements of the studies are evaluated. We do not anticipate lengthy extensions of the suspension period in order to complete the studies.

Question 39. If studies and activities under Condition #44 indicate adequate structural strength to opermit recovery of the resource at the rate originally contemplated, would the Department consider this sufficient reason to attempt to terminate suspension of the lease?

Answer. The determination that an acceptable rate of resources recovery could be obtained would not resolve the major problem which is that background levels of certain air quality parameters exceed the National Ambient Air Quality Standards. We would not terminate the suspension until this problem is also resolved.

Question 40. Explain how the Department intends to monitor or otherwise participate in lessees' compliance with Condition #4?

Answer. The Bureau of Mines will, as previously explained, participate in the lessees' mineability studies, and the Area Oil Shale Office will review the results from time to time as the work goes forward.

Question 41. Who will determine the applicable parameters and criteria upon which the judgment will be made regarding the structuural adequacy or otherwise of the rock formation in Tract C-b?

Answer. The parameters and criteria upon which the mineability of Tract C-b will be determined by the lessees and technical experts within the Department.

Question 42. Explain how it happened that the supposed structural weakness of the rock formation did not come to light during the pre-bidding exploratory period?

Answer. The structural weakness of the C-b rock was not identified during the pre-bidding exploratory period due to the number of holes drilled. The lessees' concentrated exploratory drilling program supplemented by coring of angle holes identified the weak rock zones and more complex joint systems on Tract C-b.

Question 43. Has the Department undertaken any studies or examination of the assertion of lessees of Tract C-a that "only one-fourth to one-fifth of the oil

shale resource can be recovered" if no off-tract disposal is permitted, as compared to recovery with off-site disposal of the spent shale? If so, please supply these studies.

Answer. The Tract C-a lessees' ascertain that "Only one-fourth to one-fifth of the oil shale resource can be recovered" if no off-tract disposal is permitted, as compared to recovery with off-site disposal of the spent shale is based on the comparison of surface mining of the tract and underground mining of the tract resource. The Final Environmental Impact Statement for the Prototype Oil Shale Leasing Program addressed the anticipated differences in recoverability of resources for surface mining and underground mining on Tract C-a. Recoverable tonnage figures for surface mining methods result in about 7.32 billion tons containing 30 gallons per ton or more of shale oil (Vol. III, pg. III–12). Underground mining of Tract C-a was expected to recover 1,857,000,000 tons of oil shale containing 30 or more gallons per ton (Vol. III, pg. 1–9). Comparison of the two recoverable tonnages indicate a difference of 5.4 billion tons for the two methods. The resource recovery figures presented by the lessees for surface mining and underground mining of the tract, result in similar percentage differences for recoverability of the resource between the two mining methods. Achievement of the higher resource recovery figures contemplated by the Final Environmental Impact Statement and the Tract C-a lessees can only be achieved by open pit mining of the entire tract as indicated in Vol. III, page III–10 of the Final Environmental Impact Statement. The same document envisioned off-tract disposal of waste rock and spent shale from the initial phases of either surface mining or underground mining of the tract.

The lessees' assertion that resource recovery would be reduced without off-tract disposal is based on the premise that open pit mining of the tract would be limited by the waste pile covering a substantial portion of the tract, thus reducing the amount of the tract that could be developed by open pit methods. The balance of the tract would have to be mined by underground methods at a much reduced overall recovery of the resource. Standard practice in planning open pit mining operations is to ensure that waste rock is not placed in the direction of advance of the pit. Placing the initial waste rock and spent shale on Tract C–a would result in just this violation of mining principles severely jeopardizing the potential recovery of this prime open pit resource.

An independent study of open pit mining of oil shale done for the Bureau of Mines by Sun Oil Company also identified the importance of disposing of the initial waste rock and spent shale in an off-site disposal area out of the direction of pit advance.

Question 44. Lessees of tract C–a have listed a number of events which "must transpire" if development of the tract is to occur. These are: 1) State appropriation of funds for a new road from the Town of Rangely to tract C–a; and 2) the designation by Congress of BLM lands for expansion of Rangely to accommodate an expected influx of workers. Would these additional problems fall within the Department's broad interpretation of "conservation of resources"? Please explain.

Answer. No, although these issues may be important to the lessees' ability to proceed with development of the tracts they do not appear to fall within the statutory authority for granting suspensions.

Question 45. Lessees of tract C–a have also listed three other factors "contributing to delay of operations", namely, the unresolved water use question, the pending rights of way permits from BLM, and the failure of Congress to enact a "national energy policy or program". Please assess the validity of the lessees' claim that these problems will seriously hamper development of the lease.

Answer. It would be necessary to examine each action proposed very carefully on an individual basis to determine whether it fell within the definition of "conservation of natural resources." Under some circumstances it is possible that the construction of a new road or the establishment of a housing project in one specific area rather than another might have a very definite effect on the conservation of the oil shale itself or other natural resources. Whether the conservation effect of a particular action would justify a suspension of operations could be determined only when all the facts were known.

Question 46. Has the Department taken any steps to expedite the designation of BLM lands for either the highway or for expansion of the Town of Rangely, as requested by lessees of tract C–a? Please explain.

Answer. Rio Blanco County filed application C–23560 under Revised Statutes 2477 on February 6, 1976, to obtain authority to construct a road from the

Rangely vicinity to oil shale lease tract C–a. Additional rights-of-way applications have been filed for a pipeline, power transmission line and telephone cable. None of these applications have been granted, however, the environmental analysis has been completed and construction and operation stipulations have been prepared for the road and powerline.

The Management Framework Plan for the White River Resources Area completed in FY 1975 recognized and provided for making lands available for expansion of the town of Rangely. This has been implemented to the extent possible under existing law. An area of 2,519 acres, comprising most, or all, of the public lands in the Rangely Master Plan, have been proposed for classification for Recreation and Public Purposes.

This action temporarily segregates the land from spurious mining claim locations, it is not appropriate vehicle for transfer of title to accommodate residential or business uses (S. 507 provides appropriate authority for such transfers).

Classification has been completed and Recreation and Public Purpose Act leases have just been issued to the Western Rio Blanco Metropolitan Recreation District for recreation facilities, and to the Rangely School District for a site for a new elementary school. These sites conform to the Master Plan for Rangely. We understand that construction of these facilities is underway.

We have also approved a right-of-way for a new water plant facility to upgrade Rangely's water system.

Question 47. Has the Department assessed the results of studies, contracted out by lessees of tract C–a, relative to the planned expansion of the Town of Rangely?

Answer. We have reviewed the C–a lessees' "Social and Economic Impact Statement" issued March 1976. This identified certain specific State and Federal actions needed before RBOSP can proceed. We are actively working on some of these issues. Gulf Oil Real Estate Development Company has also prepared a Master Plan for the town of Rangely. We are presently making a detailed review of this plan.

Question 48. Lessees of Tract C–b in their application mention research indicating that greater efficiency of recovery may be achieved by improved methods of retorting the shale, and appear to view this as a possible conservation of the resource. Would the Department consider that the pendency of such research and its possible effect upon the economics of the project would offer additional justification for suspension of the leases, or for extending suspension beyond the original period?

Answer. The possibility of greater recovery of shale oil from a given quantity of oil shale in place would obviously be conservation of the resource. Known oil shale retorting technology is considered commercial but increased efficiencies will be expected as commercial operating experience is obtained. The potential for enhanced recovery of the resource through research to improve methods of retorting of the shale would not be justification for extending suspension beyond the original period.

Question 49. What is the status of Shell's application to ERDA for assistance in conducting further research into improved retorting methods?

Answer. According to information received from the lessee, a presentation to ERDA was made, but no answer has been received to date. Of course, on Tuesday, November 2 Shell Oil Company announced that it was withdrawing from the C–b lease. We do not know how this will affect Shell's plans for oil shale development.

Question 50. Does the Department agree with the lessees of Tract C–b that the period of suspension should allow for completion of various legislative actions (i.e., enactment of investment tax credits) and that the lessee should be free to decide whether to proceed or not on that basis?

Answer. Economic incentives resulting from legislation were not considered by the Department in reaching a decision on suspension of operations. Only factors previously stated were considered.

Question 51. How does the Department assess the statement made by lessees of tract C–a that "until Congress enacts a National Energy Policy or Program" lessees would be ill-advised to make decisions concerning the commercial feasibility of the project?

Answer. As stated in our answer to question 45 the term "National Energy Policy or Program" is very broad and is subject to varying definitions. The lessees from time to time have mentioned threat of vertical and horizontal divestiture, lack of congressional support for a major synethetic fuels R&D

program, price controls, and lack of incentives to foster investments in synthetic fuels facilities as impediments to the commercialization of synthetic fuels technologies. However, these matters were not considered by the Department in processing the lessees' suspension applications.

Question 52. It would appear from statements made in the application for suspension of both Tract C-a and C-b lessees that the absence of what is termed "a more favorable political climate" is the cause of underlying concern to the lessees. Does the Department feel that this is indeed a major roadblock in developing the prototype oil shale lease program, or are there inherent difficulties, such as the lack of adequate water supplies, which are more to blame?

Answer. There may well be roadblocks to development resulting from what the lessees call the absence of a "more favorable political climate," i.e., authority is not granted the Department to authorize use of offsite lands in the development of Tract C-a, maximum resource recovery and thus conservation of the oil shale resource is not considered possible. "Inherent difficulties, such as adequate water" or any other such difficulties have not been identified in any of the Detailed Development Plans, other than the air quality baseline levels and the resource recovery problems which led to the suspension requests. Certain other political issues such as divestiture, and price controls obviously will influence any major investment decisions of the lessees.

Question 53. What is the present status of applications for suspensions for Tracts U-a and U-b?

Answer. A revised application for suspension of operations was submitted on September 27, 1976. A notice of Suspension of Operations was granted effective November 1.

Question 54. Lessees for Tracts U-a and U-b have based their applications in part on their professed inability to meet air quality standards. Were these standards not in effect at the time leasing occurred?

Answer. As in the case of the Colorado leases, the National Ambient Air Quality Standards were in effect at the time the bids were submitted, but it was not known that the existing air quality in the Uintah Basin exceeded the NAAQS until the baseline data collection programs provided actual measurements. Also, the no significant deterioration regulations were adopted after the leases were issued. These regulations have also been subsequently amended.

Question 55. Is there any reason why there has been no apparent attempt made to reclassify the area of these tracts for air quality purposes?

Answer. The reclassification request in Rio Blanco County, Colorado is considered by the lessees to be necessary because the Colorado incremental sulfur dioxide standard Category I for that county is more stringent than Federal Standards. The Utah standards are the same as the Federal significant deterioration standards. The lessees predict operations can comply with the applicable sulfur dioxide standards in the State of Utah. The Federal Significant Deterioration Standards should not be confused with the National Ambient Air Quality Standards which are exceeded by baseline levels of nonmethane hydrocarbon and ozone in the Uintah Basin.

Question 56. Under the heading "Recovery of Crude Oil Shale," the two applications refer to the infeasibility of mining and retorting 28-per-gallon shale "under the current economic and technical environment." Has the Department checked this assertion in light of other technological options which may be available, such as in situ development?

Answer. The question is now moot, as the revised application for suspension does not contain the reference, nor have economics ever been considered under procedures for granting suspensions.

Question 57. What, if any, are the results or the study?

Answer. No longer applicable, as explained in previous response.

Question 58. In their application, lessees propose a joint industry-government R&D effort to advance oil shale technology, and suggest that suspension of their leases pending the organizing and completing of that effort would be appropriate. Does the Department agree?

Answer. The question does not apply, as the revised application for suspension does not contain the referenced statement.

Question 59. Lessees state that "under the present economic, political and technical environment, the financial burdens and risks are too great to bear alone." This statement seems to expose the true reason for all of the applications, including those for Tracts C–a and C–b. What does this have to do with conservation of resources under Sec. 39?

Answer. Although the revised application for suspension does not contain this statement, we do not consider economic and political issues to be valid reasons for granting suspensions of operations.

Question 60. Beyond waiving bonus payment due on certain dates, and beyond postponement of payment of minimum royalties by the lessees, what would be the effect of suspension of leases for tracts U–a and U–b?

Answer. The effect of the suspension on tracts U–a and U–b will be to stop all operations on the leased land except those necessary to protect the land and resources. Environmental monitoring is being allowed to continue.

Question 61. If suspension amounts to waiving bonus payments and postponing minimum royalties, does this not amount to giving the lessees a hidden subsidy by allowing them to pre-empt a valuable public resource without making payments for which they are obligated? Please explain your answer.

Answer. There is no "hidden subsidy" in the suspension of the leases; the suspension is not a subsidy at all. A reading of the lease clearly reveals that a suspension of operations will have the effect of changing the dates on which bonus installments are due and of postponing the time when minimum royalties must be paid. At the time when the lease was issued, there was no intention to issue a suspension, but it was always known that a suspension could be granted when justified, and the lease specifically provided for a suspension. All of this was understood when the lease was offered, and we assume that the bonus offered reflected an evaluation of all the terms of the lease. The Department does not believe that granting of a suspnsion for conservation of resource purposes due to problems beyond the lessee's control results in subsidizing lessees.

Question 62. What is the impact upon either granting or refusing suspension of leases for tracts U–a and U–b of ongoing litigation concerning the rights of the State of Utah in these lands?

Answer. The granting or denial of suspensions for the leases on tracts U–a and U–b will not affect rights of the State of Utah to the land and deposits embraced in the leases. The State of Utah was consulted on this matter and expressed no opposition to the suspensions.

Question 63. In its report to Congress, entitled "An Evaluation of Proposed Federal Assistance for Financing Commercialization of Emerging Energy Technologies," GAO concludes that synthetic fuels production when analyzed by an incremental cost standard, is not cost-effective. GAO furthermore recommends that Government financial assistance for commercial development of synthetic fuels should not be provided at this time. Please comment in terms of oil shale development.

Answer. While Department of the Interior has not analyzed the GAO report in great depth in general we feel the GAO statement on the cost-effectiveness of synthetic fuel technologies is erroneous because:

(1) It's measures and definition of cost-effective are not given.

(2) It compares synthetic gaseous fuels with present controlled natural gas prices rather than with prices of future gaseous energy sources.

(3) The economic comparison of synthetic fuel prices and crude oil prices are made for current crude prices rather than future crude oil prices which would be extant at the time the synfuels plants actually come on line.

(4) The oil shale prices quoted in the report identify only the highest shale oil price estimates (e.g., RDA's high estimate) and do not reflect the full range of prices for different technologies and deposits.

Question 64. On page 36 the GAO report states that "some recent industry estimates of expected cost of shale oil range up to $18.90 per barrel". How does this statement accord with the Department's information on this subject?

Answer. The GAO report skews its conclusions by using ERDA's *high* estimate for oil shale ($18.00 per barrel compared to a central estimate of $15 per barrel) and the *high end* of *some* industry estimates. By themselves such figures are not comparable and are for the most part meaningless since various financial, resource and technical assumptions greatly affect these estimates. Comparing such estimates without adjusting for their underlying assumptions is like comparing the proverbial apples and oranges. Based on recent studies by the lessees and contract studies done for the Department it has been shown that for modified in situ technologies a range of $5.75 to $13.56 per barrel can result with proper selection of input variables. (Technical and Economic Study of the Modified In Situ Process for Oil Shale, Fenix and Scisson, November 1976)

Further our lessees have estimated price ranges of $14 to $18 per barrel using conventional mining and retorting technology. These figures can be substantially reduced using combined technologies.

In short we remain convinced that present commercial oil shale technology will be competitive with a world oil price of $15 to $17 per barrel by 1980. However, these estimates can only be confirmed by following through on the Department's Prototype Leasing Program.

Question 65. GAO also suggests in its report that oil shale development (as with other synfuels technologies) will need three levels of financial assistance—front end money, construction assistance, and product price supports—in order to become economically viable. Would you agree with this analysis? Please elaborate.

Answer. First, the GAO report does not say that oil shale development "*will* need three levels of financial assistance." Rather it says that "synthetic fuels technologies *appear* to us to be the only ones which *could* need all three levels. . . ." Furthermore, we do not believe the GAO conclusion is based on any rigid analysis, but rather it is simply an unsupported conclusion.

Question 66. Taking issue with the overall conclusions of this GAO report, ERDA in its detailed critique published in the Congressional Record for September 20, 1976, cites the case of oil shale as being one emerging technology potentially competitive with existing or other emerging technologies. ERDA quotes Union Oil as indicating that the output of its plant "will, with only a government loan guaranty, be competitive with existing world oil prices." Are you familiar with this claim and if so would you provide the Department's assessment of it?

Answer. We are aware of Union Oil's statement, but we have no information for assessing its accuracy. Some industry people do consider high quality upgraded shale oil to be competitive under some circumstances with imported crude petroleum of similar quality, with only a Government loan guaranty. This is one of the points that was brought out in a paper presented by officials of TOSCO Corporation at a Symposium on the Commercialization of Synthetic Fuels, held in Colorado Springs in February 1976.

Question 67. ERDA points out that there have been industry estimates of shale oil costs as low as $15 and $13.75 per barrel; even at $18.90 ERDA maintains that shale oil is "fully competitive with oil produced by tertiary processes Please comment.

Answer. The three estimates of per barrel shale oil costs are within the range of costs which have been cited by industry. The estimated cost per barrel depends not only on the physical production problems to be overcome, but also on the assumptions as to rate of return, type of financing and rate of inflation. Without information on the specific assumptions underlying each estimate, further comment would be difficult.

The statement that "even at $18.90, . . . shale oil is 'fully competitive with oil produced by tertiary process'" depends, in addition, upon the definition of tertiary processes and the level of production at which the comparison is made. If thermal recovery by steam-soak and steam-drive are included in the definition, it should be pointed out that commercial production by these methods has been estimated at 235,00 barrels daily and is expected to increase. Tertiary recovery also may include a number of other enhanced recovery techniques, the economics of which depends on a number of considerations such as the particular technique chosen, the type of oil, the nature of the reservoir, the available and cost of the chemicals or other additives used in the process, and the depth of the field. A few projects where special combinations of the conditions are satified are now commercial with estimated totol production of 35,000 barrels daily. However, a major increase in production by these methods at this time could involve extremely large investments and substantially higher costs per barrel than those of the few existing profitable projects.

Question 68. Did the Department, in evaluating applications for suspension of oil shale leases, make any use of the analysis done by the Interagency Task Force on Synthetic Fuels under the President's Energy Resources Council, with reference to oil shale development?

Answer. No.

Question 69. ERDA referred to suspension of the leases as pointing up the need for Government financial support for the industry. In the Department's judgment, is this assumption justified or not?

Answer. The prototype leases were not suspended because of economic reasons. Should the offsite question and air quality issue be resolved, the Department would lift the suspension with the expectation that the lessees would proceed with development according to their approved DDP's. However, because of the

uncertainties which would still remain and the very large capital investments which are necessary for commercial oil shale development some form of Government risk sharing may be necessary and desirable in order to bring a first generation commercial scale oil shale plant on line

NOTICE OF SUSPENSION OF OPERATIONS

Pursuant to Section 39 of the Mineral Leasing Act (30 USC 209) and Sections 1(d) and 22 of the Oil Shale Lease Number C–20341, and pursuant to the authority granted to the Mining Supervisor by Departmental Order 2699 and Geological Survey Order 218, a Suspension of Operations is hereby granted to the Shell Oil Company and Ashland Oil Inc., (Lessees) holders of Oil Shale Lease C–20341. Said suspension of operations will commence on September 1, 1976 and terminate on September 1, 1977 unless extended by the Mining Supervisor.

Any application for extension of this suspension of operations will be submitted to the Mining Supervisor at least 90 days prior to the termination date.

The suspension of operations may be terminated at any time by mutual consent of the Lessees and the Mining Supervisor.

The suspension of operations is subject to the following listed conditions:

1. Written consent of all bonding companies and/or other sureties shall be submitted to the Mining Supervisor.

2. Lesses will complete the two-year Baseline Data Collection Program and shall submit the data collected to the Mining Supervisor pursuant to the existing approved program.

3. Lessees will submit a final report on the two-year baseline program analyzing the data collected which will include appropriate sections on ecological interrelations as required by lease stipulation 1(C)(2)(d) within six months following completion of the two-year baseline data collection period.

4. Lessees will implement additional mineability studies and activities as approved by the Mining Supervisor.

5. Lessees will implement an interim environmental monitoring program to commerce immediately upon the completion of the two-year baseline data program. The purpose of the program is: to maintain continuity of data gathering on critical parameters of the environmental baseline program; to further explore identified problem areas; to provide the Government and the Lessee with further knowledge of environmental conditions on the lease tract, and to permit rapid commencement of operations at the end of the suspension period.

The interim environmental monitoring program shall be based upon continuing analysis of the data from the baseline program and shall be integrated with that program. The program shall include continued air quality and meteorology at selected stations, hydrologic monitoring at selected surface and ground water stations, and biological monitoring of important parameters in accord with ecological survey methodolgy. Lessee shall submit within 30 days prior to completion of the Baseline Data Collection Program a plan to carry out the interim environmental monitoring program to the Mining Supervisor for his approval. The Lessee will submit reports on the interim monitoring program semiannually.

6. Lessees will maintain facilities and conduct any work on the leased lands authorized by the terms of this Notice of Suspension in accord with the terms of the lease during the period of suspension. Facilities shall not be removed from the leased lands without permission of the Mining Supervisor.

7. Lessees shall continue existing revegetation program during the period of suspension.

THE UNITED STATES OF AMERICA,
PETER A. RULTEDGE,
Area Oil Shale Supervisor,
U.S. Geological Survey.
August 20, 1976.

Accepted by:
SHELL OIL CO.,
K. DATG,
Attorney-in-Fact.

August 26, 1976.

ASHLAND OIL, INC.
GEORGE C. HARDIN, JR.,
Attorney-in-Fact.

August 25, 1976.

NOTICE OF SUSPENSION OF OPERATIONS

Pursuant to Section 39 of the Mineral Leasing Act (30 USC 209) and Sections 1(d) and 22 of the Oil Shale Lease Number C–20046, and pursuant to the authority granted to the Mining Supervisor by Departmental Order 2699 and Geological Survey Order 218, a Suspension of Operations is hereby granted to the Gulf Oil Corporation and Standard Oil Company (Indiana), (Lessees) holders of Oil Shale Lease C–20046. Said suspension of operations will commence on September 1, 1976 and terminate on September 1, 1977 unless extended by the Mining Supervisor.

Any application for extension of this suspension of operations will be submitted to the Mining Supervisor at least 90 days prior to the termination date.

The suspension of operations may be terminated at any time by mutual consent of the Lessees and the Mining Supervisor.

The suspension of operations is subject to the following listed conditions:

1. Written consent of all bonding companies and/or other sureties shall be submitted to the Mining Supervisor.

2. Lessees will complete the two-year Baseline Data Collection Program and shall submit the data collected to the Mining Supervisor pursuant to the existing approved program.

3. Lessees will submit a final report on the two-year baseline program analyzing the data collected which will include appropriate sections on ecological interrelationships as required by Lease Environmental Stipulation 1(C)(2)(d) within six months following completion of the two-year baseline data collection period.

4. Lessees will implement an interim environmental monitoring program to commence immediately upon the completion of the two-year baseline data program. The purpose of the program is: to maintain continuity of data gathering on critical parameters of the environmental baseline program; to further explore identified problem areas; to provide the Government and the Lessee with further knowledge of environmental conditions on the lease tract, and to permit rapid commencement of operations at the end of the suspension period.

The interim environmental monitoring program shall be based upon continuing analysis of the data from the baseline program and shall be integrated with that program. The program shall include continued air quality and meteorology at selected stations, hydrologic monitoring at selected surface and ground water stations and biological monitoring of important parameters in accord with ecological survey methodology.

Lessee shall submit within 30 days prior to completion of the Baseline Data Collection Program a plan to carry out the interim environmental monitoring program to the Mining Supervisor for his approval. The Lessee will submit reports on the interim monitoring program semiannually.

5. Lessees will maintain facilities and conduct any work on the leased lands authorized by the terms of this Notice of Suspension in accord with the terms of the lease during the period of suspension. Facilities shall not be removed from the leased lands without permission of the Mining Supervisor.

6. Lessees shall continue existing revegetation research programs during the period of suspension.

THE UNITED STATES OF AMERICA,
PETER A. RUTLEDGE,
Area Oil Shale Supervisor,
U.S. Geological Survey.

Date August 19, 1976.

Accepted by:
GULF OIL CORP.

_____,
Attorney-in-Fact.
Date August 19, 1976.

STANDARD OIL COMPANY (INDIANA)

_____,
Attorney-in-Fact.
Date August 19, 1976.

Effective November 1, 1976.

NOTICE OF SUSPENSION OF OPERATIONS

Pursuant to Section 39 of the Mineral Leasing Act (30 USC 209) and Sections 1(d) and 22 of the Oil Shale Lease Number U–26194, and pursuant to the authority granted to the Mining Supervisor by Departmental Order 2699 and Geological Survey Order 218, a Suspension of Operations is hereby granted to the Sohio Petroleum Company. (Lessee), holder of Oil Shale Lease U–26194. Said suspension of operations will commence on November 1, 1976 and terminate on November 1, 1977 unless extended by the Mining Supervisor.

Any application for extension of this suspension of operations will be submitted to the Mining Supervisor at least 90 days prior to the termination date.

The suspension of operations may be terminated at any time by mutual consent of the Lessee and the Mining Supervisor.

The suspension of operations is subject to the following listed conditions:

1. Written consent of all bonding companies and/or other sureties shall be submitted to the Mining Supervisor.

2. Lessee will complete the two-year Baseline Data Collection Program and shall submit the data collected to the Mining Supervisor pursuant to the existing approved program.

3. Lessees will submit a final report on the two-year baseline program analyzing the data collected which will include appropriate sections on ecological interrelationships as required by Lease Environmental Stipulation 1(C) (2) (d) within six months following completion of the two-year baseline data collection period.

4. Lessees will implement an interim environmental monitoring program to commence immediately upon the completion of the two-year baseline data program. The purpose of the program is: to maintain continuity of data gathering on critical parameters of the environmental baseline program; to further explore identified problem areas; to provide the Government and the Lessee with further knowledge of environmental conditions on the lease tract, and to permit rapid commencement of operations at the end of the suspension period.

The interim environmental monitoring program shall be based upon continuing analysis of the data from the baseline program and shall be integrated with that program. The program shall include continued air quality and meteorology at selected stations, hydrologic monitoring at selected surface and ground water stations and biological monitoring of important parameters in accord with ecological survey methodology.

Lessee shall submit no later than January 1, 1977 a plan to carry out the interim environmental monitoring program to the Mining Supervisor for his approval. The Lessee will submit reports on the interim monitoring program semiannually.

5. Lessee will maintain facilities and conduct any work on the leased lands authorized by the terms of this Notice of Suspension in accord with the terms of the lease during the period of suspension. Facilities shall not be removed from the leased lands without permission of the Mining Supervisor.

6. Lessee shall continue existing revegetation research program during the period of suspension.

THE UNITED STATES OF AMERICA,
PETER A. RUTLEDGE,
Area Oil Shale Supervisor,
U.S. Geological Survey.

Date October 22, 1976.
Accepted by:
SOHIO PETROLEUM CO.,
300 Enterprise Building,
Third and Main Streets
Grand Junction, Colo.
By ——— ———.
Vice president.
Date October 25, 1976.

NOTICE OF SUSPENSION OF OPERATIONS

Pursuant to Section 39 of the Mineral Leasing Act (30 USC 209) and Sections 1(d) and 22 of the Oil Shale Lease Number U–25918, and pursuant to the authority granted to the Mining Supervisor by Departmental Order 2699 and Geological Survey Order 218, a Suspension of Operations is hereby granted to the Phillips Petroleum Company and Sunoco Energy Development Company, (Lessees), holders of Oil Shale Lease U–25918. Said suspension of operations will commence on November 1, 1976 and terminate on November 1, 1977 unless extended by the Mining Supervisor.

Any application for extension of this suspension of operations will be submitted to the Mining Supervisor at least 90 days prior to the termination date.

The suspension of operations may be terminated at any time by mutual consent of the Lessees and the Mining Supervisor.

The suspension of operations is subject to the following listed conditions:

1. Written consent of all bonding companies and/or other sureties shall be submitted to the Mining Supervisor.

2. Lessees will complete the two-year Baseline Data Collection Program and shall submit the data collected to the Mining Supervisor pursuant to the existing approved program.

3. Lessees will submit a final report on the two-year baseline program analyzing the data collected which will include appropriate sections on ecological interrelationships as required by Lease Environmental Stipulation 1(C)(2)(d) within six months following completion of the two-year baseline data collection period.

4. Lessees will implement an interim environmental monitoring program to commence immediately upon the completion of the two-year baseline data program. The purpose of the program is: to maintain continuity of data gathering on critical parameters of the environmental baseline program; to further explore identified problem areas; to provide the Government and the Lessee with further knowledge of environmental conditions on the lease tract, and to permit rapid commencement of operations at the end of the suspension period.

The interim environmental monitoring program shall be based upon continuing analysis of the data from the baseline program and shall be integrated with that program. The program shall include continued air quality and meterology at selected stations, hydrologic monitoring at selected surface and ground water stations and biological monitoring of important parameters in accord with ecological survey methodology.

Lessee shall submit no later than January 1, 1977 a plan to carry out the interim environmental monitoring program to the Mining Supervisor for his approval. The Lessee will submit reports on the interim monitoring program semiannually.

5. Lessees will maintain facilities and conduct any work on the leased lands authorized by the terms of this Notice of Suspension in accord with the terms of the lease during the period of suspension. Facilities shall not be removed from the leased lands without permission of the Mining Supervisor.

6. Lessees shall continue existing revegetation research programs during the period of suspension.

THE UNITED STATES OF AMERICA,
PETER A. RUTLEDGE,
Area Oil Shale Supervisor,
U.S. Geological Survey.

Date October 22, 1976.

Accepted by:
SUNOCO ENERGY DEVELOPMENT CO.
12700 Park Central Place, Suite 1500
Dallas, Tex.

PHILLIPS PETROLEUM CO.,
324–A Frank Phillips Building,
Bartlesville, Okla.
By W. F. BOHON,
Attorney-in-Fact.
Date October 25, 1976.

By M. O. WOLFE,
Vice President.
Date October 26, 1976.

SHELL OIL CO.,
Houston, Tex., March 3, 1976.

Re Oil Shale Lease C–20341. Application for Suspension of Operations.
Mr. PETE RUTLEDGE,
Area Oil Shale Supervisor,
Mesa Federal Building, Grand Junction, Colo.

DEAR MR. RUTLEDGE: Enclosed are three copies of an application for suspension of operations on the C–b Shale Oil Project. While it is with regret that this application is filed, it is nevertheless necessary to do so in light of certain developments.

During the 23-month period which has elapsed since acquiring the lease on Tract C–b, certain technical, economic, and political developments have impaired the capability of the lessees to develop the C–b tract into a commercially successful shale oil venture. The combined effect of these developments and inherent risks involved in a capital-intensive venture of this magnitude, is of such significance that two of the original lessees recently found it necessary to withdraw from the venture by assigning their interests to the remaining lessees. While an extended period of time may be required to do so, Shell and Ashland are actively seeking suitable new partners with whom the economic risk might be shared; however, even if we are successful in locating suitable partners, the magnitude of the risks may continue to deter us from proceeding with development of the tract.

While the enclosed application discusses those obstacles which directly relate to the statutory basis for a suspension of operations, i.e. "the interest of conservation", we would be remiss if we did not also note certain other impediments to project development, as well as possible benefits which current research activities might make possible. These additional impediments, which have arisen from a general hostility toward the petroleum industry, include not only recently enacted price controls on crude oil and petroleum products, but perhaps more importantly, include various proposed legislative measures on both the state and federal levels, ranging from burdensome state severance taxes to horizontal and vertical dismemberment of the integrated petroleum companies. If enacted, some of these proposals, as well as proposed amendments to the Clean Air Act as discussed in our application for a suspension, would not only impair our ability to generate capital necessary to develop the project, but could also prohibit us from developing any oil shale or other alternative energy resources. Hopefully, during a suspension period, the fate of at least some of these legislative proposals will become known and the lessees will then be able to make a rational decision whether to proceed with development. (Perhaps too, some form of incentive legislation such as investment tax credits will be enacted to help ease the financial burden.)

Beyond the negative factors which impair the lessees' ability to develop the project, Shell has been independently conducting research activities related to methods of shale oil extraction. Laboratory studies have indicated the possibility of achieving a significantly greater efficiency of recovery than can be attained by present-day retorting methods. Assuming these indications can be confirmed by larger scale experiments, not only would shale oil economics be improved, but also conservation of oil shale resources would be increased. Shell intends to present its findings to the Energy Research and Development Administration for evaluation, and if favorable, we intend to solicit ERDA assistance in conducting further research and development, including large scale demonstrations. While this retorting technology may not be developed in time to be utilized on the C–b Project, the anticipated benefits would include a five to ten percent improvement in energy efficiency over other known retorting methods; lower capital costs resulting from utilization of less processing equipment; and reduced water consumption rates for cooling spent shale (resulting from discharge at substantially lower temperatures than competing technology). Although several years will be required for development of this technology, it might offer some opportunity for a more attractive project if an extended suspension period should become necessary.

In conclusion, while many obstacles must be overcome if the C–b Shale Oil Project is to be commercially successful and contribute in some degree to the national policy of attaining energy independence, those obstacles do not appear

to be insurmountable. On the other hand, absent a more favorable political climate than exists today, we have grave doubts whether a viable shale oil industry can be developed in the United States.

Very truly yours,

K. Doig.

Enclosure.

U.S. Department of Interior Geological Survey

APPLICATION FOR SUSPENSION OF OPERATIONS ON OIL SHALE LEASE C–20341

Pursuant to Section 39 of the Mineral Leasing Act (30 USC § 209), the undersigned, Shell Oil Company and Ashland Oil Inc., as lessees and assignees of record title to the above designated oi lshale lease issued effective April 1, 1974 Shell Oil Company, operator, hereby make application to the Secretary of the Interior for a suspension of operations on such lease, which covers the following described land under the jurisdiction of the Colorado State Office of the Bureau of Land Management, generally referred to as Federal Lease Tract C-b, referenced as C–20341, and more particularly described as follows:

T–3–S, R–96–W, 6th P.M.

Sec. 5: W–½ SE–¼, SW–¼.
Sec. 6: Lots 6 and 7, E–½, SW–¼, SE–¼.
Sec. 7: Lots 1, 2, 3 and 4, E–½, W–½, E–½.
Sec. 8: W–½, NE–¼, NW–¼, S–½.
Sec. 9: SW–¼.
Sec. 16: NW–¼, W–½, SW–¼.
Sec. 17: All.
Sec. 18: Lots 1, 2, 3 and 4, E–½, W–½, E–½.

T–3–S, R–97–W, 6th P.M.

Sec. 1: S–½.
Sec. 2: SE–¼.
Sec. 11: E–½.
Sec. 12: All.
Sec. 13: N–½.
Sec. 14: N–½, NE–¼.

situated in the county of Rico Blanco, State of Colorado, containing 5,093.90 acres, more or less.

The C-b Oil Shale Lease was acquired as part of the Federal Government's prototype oil shale leasing program. As a "prototype" or research-oriented endeavor, an objective of the C-b Project has been to evaluate alternative technological approaches to oil shale development and to demonstrate the feasibility of applying that technology which appears to offer the greatest opportunity for success in a commercial-scale shale oil venture while at the same time, insuring the least practicable environmental disturbance. Although the approach chosen, as described in the Detailed Development Plan submitted February 9, 1976 to the Area Oil Shale Supervisor, appears to be the alternative most likely to accomplish these objectives, certain unanticipated developments and changing conditions (as often occurs in a research program) have necessitated a re-evaluation of available alternatives in order to insure recovery of sufficient reserves to justify continuation of the project. If a suspension of operations is granted to allow the lessees time in which to consider alternatives which might achieve a greater ultimate recovery of the oil shale resource in a manner which is, nevertheless, environmentally acceptable, the interests of conservation of both the resource and the environment would thereby be served.

Exploratory operations to date have revealed technical uncertainties with respect to rock mechanics and their effect on attainable extraction ratios. Data obtained during this exploration phase has indicated the formation to be structurally weaker than anticipated, thus requiring larger than anticipated pillars to be left in place in order to provide necessary roof support, thereby reducing the reserve potential upon which the success of the project depends. Accordingly, time will be required to further evaluate the rock mechanics data which have been collected and to consider whether sufficient reserves can be recovered to justify continuation of the project, as well as to consider possible alternative min-

ing methods which might achieve a greater ultimate recovery of oil shale in place.

We anticipate that approximately 18 months will be required for a complete evaluation of data collected and for a thorough study of possible variations and alternatives to the standard room and pillar design, including modifications such as multi-level room and pillar with and without subsidence, pillar recovery with partial fill, and room and rib with fill. In addition to the foregoing modifications of the room and pillar concept, we will also study various alternative mining techniques, including sub-level open stoping with pillar recovery, sub-level open stoping with back fill, sub-level caving, and block or induced caving.

During the feasibility study, not only will technical factors such as mine design and attainable extraction ratios be considered, but also other aspects of the mine plan such as mine safety, environmental consequents and project economics must be evaluated. Some of the alternative mining methods were initially rejected in favor of the conventional room and pillar technique because the latter is not only a proven method, but also seems to have minimal environmental impact, i.e. no significant surface subsidence. We believe, however, that not only should some surface subsidence be acceptable, it may even be desirable when considering spent shale disposal sites.

In the event the foregoing feasibility study reveals the conventional room and pillar mine design concept to be preferable even though the reserve potential of the tract may then be insufficient to support the investment, the lessees may be able to achieve lower unit costs and improve the overall economics of the project by enlarging the area of mineable reserves. Efforts are presently underway to evaluate the potential of other scattered oil shale holdings of the lessees and exchange these holdings for Federal lands adjoining the C–b tract. By enlarging the mining unit, we may be able to increase recoverable reserves sufficiently to justify continuation of the project from an economic standpoint, even if we ultimately determine that improved reserve potential cannot be achieved by alternative mining techniques.

Beyond the foregoing considerations which relate specifically to Tract C–b, certain proposed legislation and regulations could play a dramatic role in the development of any shale oil industry in the United States. Among the most significant measures are certain proposed amendments to the Clean Air Act and the "Implementation Plans" for the "Prevention of Significant Air Quality Deterioration", 39 Fed. Reg. 42510 (1974), which if enacted or upheld, would inhibit any significant industrial development in western Colorado, including the Tract C-b area, whether shale oil or otherwise. If significant on-tract development activity were to continue, and subsequently, the proposed Clean Air Act amendments and implementation plans become law, thereby prohibiting continuation of the project, any environmental disturbance, however slight, would have been fruitless. Even though the tract could be restored to a condition essentially similar to its pre-activity condition through reclamation efforts, avoiding the need to restore the land is certainly the environmentally preferable approach where no benefit is to be realized from the initial disturbance. Accordingly, a suspension of operations until the fate of this legislation and regulation become known would be in the interest of environmental conservation.

On the positive side in the legislative arena, H.R. 11163, introduced December 15, 1975, would amend the Mineral Leasing Act to make additional Federal lands available to oil shale lessees for off-tract facility siting, waste disposal and other lease operations except mining. Assuming this bill is enacted, alternative facility and disposal sites thereby made available could significantly alter development plans and promote the interest of conservation by contributing to improved recovery of the resource, and possibly, by providing more favorable shale disposal sites. Off-tract facility and shale disposal sites would allow recovery of the oil shale resource in areas of the tract where no mining is presently contemplated in order to provide necessary subjacent support for the overlying facilities and materials, and further, if spent shale may be spread over a wider area made available by off-tract disposal sites, certain aesthetic advantages could be realized since a shale pile of 200 feet in height, as contemplated by the present development plan, may then be unnecessary. A suspension would afford the lessees the opportunity to consider available alternatives in the event this legislation is enacted.

Pending resolution of the matters discussed, a suspension of operations would serve the interests of conservation and development, as the oil shale resource would be conserved while technical rock mechanics data are being re-evaluated,

and also during this period environmental conservation would be promoted as the leasehold would remain unchanged since the lessees would be delaying major on-tract development activity until such time as the ultimate success of the project is more cetrain. Although we propose continuing environmental baseline data gathering until completed in November, 1976, we respectively request that a suspension of operations, including suspension of the lease term and all operating and payment obligations under the lease, be approved effective March 1, 1976 to continue for 18 months thereafter, unless lessees elect to resume operations prior to that date, and subject to lessees' right to apply for an extension of the suspension if the obstacles discussed above have not been eliminated at that time.

We certify the statements herein are true, complete and correct to the best of our knowledge and belief and are made in good faith.

Executed this second day of March, 1976.

SHELL OIL CO.,
P.O. Box 2463,
Houston, Tex.

By K. DOIG.

ASHLAND OIL, INC.,
1401 Winchester Ave.,
Ashland, Ky.

By: GEORGE C. HANLIN, Jr.

THE UNITED STATES OF AMERICA

In accordance with the foregoing application, suspension of operations granted, effective from _____, 1976, until _____, 197—.

U.S. DEPARTMENT OF THE INTERIOR

APPLICATION FOR SUSPENSION OF OPERATIONS AND PRODUCTION UNDER OIL SHALE LEASE SERIAL U–25918

The undersigned, Phillips Petroleum Company and Sunoco Energy Development Company, Applicants ("Applicants"), hereby make application to the Secretary of the Interior for a suspension of operations and production under Oil Shale Lease ("Lease") entered into between the United States of America, as Lessor, and Phillips Petroleum Company and Sun Oil Company (Delaware), as Lessee, effective June 1, 1974, Serial U–25918, Tract U–a, covering the following lands situated in Uintah County, State of Utah:

Township 10 South, Range 24 East, S.L.M., Utah

Section 19: E1/2; section 20: A11; section 21: A11; section 22: A11; section 27: A11; setcion 28: A11; section 29: A11; section 30: E1/2; section 33: N1/2; section 34: N1/2;

containing 5,120 acres, more or less.

Immediately after the effective date of the Lease, Applicants and the Lessee of Oil Shale Lease U–26194, Tract U–b, formed the White River Shale Project ("Project") for the purpose of establishing a plan for the joint development of Tracts U–a and U–b. White River Shale Oil Corporation was the original lessee under the lease covering Tract U–b and its interest in said lease was assigned to Sohio Petroleum Company on December 31, 1975. The objectives of the Project were to evaluate various technological approaches which could be used to mine by underground means, the rock from the leased lands and to develop a process to extract the shale oil therefrom, all in an orderly manner.

As grounds for support of this Application for Suspension, Applicants respectfully submit the following:

I. AIR QUALITY

During the course of undertaking the base line studies required of Applicants under the terms of the Lease, Applicants have determined that the air quality of the area where Tract U–a is located exceeds the national standards of the Clean Air Act (42 U.S.C. §§ 1857, *et seq.*). See Applicants' Detailed Development Plan, Volume 1, Part 2, Section 2.4, subsection 2.4.3.1, Gaseous Pollutants, and, Applicants' First Year Environmental Baseline Report, Volume I, Part III. C.1, Gaseous Pollutants.

There is currently pending before the United States Congress certain bills which seek to amend the Clean Air Act. The final outcome of this legislation could determine whether or not Applicants, as Lessee, could comply with the air quality standards which would be required by such legislation if enacted.

II. RECOVERY OF CRUDE OIL SHALE

There are approximately 540,000,000 barrels of shale oil contained in 28 gallons per ton oil shale on Tract U–a, and the Project seeks to recover approximately 70% of this resource, or 378,000,000 barrels, by underground mining. However, the current economic and technical environment has rendered unfeasible the recovery of shale oil from shale averaging only 28 gallons per ton. Yet if the Project were forced by economics to mine a richer ore zone, the overall recovery from the leased land would be reduced. At the present time an economically viable operation does not appear feasible, however, as an example, if by mining only shale averaging 34 gallons per ton were feasible, then the ultimate recovery would be reduced by 147,000,000 barrels. Moreover, mining of the higher grade zone would probably eliminate later economic mining of the remaining lower grade shale, thereby causing a substantial, permanent reduction in overall resource recovery from the leased land.

III. MINING AND RETORTING TECHNOLOGY

The present stage of mining and retorting technology is not adequate to allow Applicants to proceed directly into commercial development. Much more information is needed to satisfactorily resolve the many technical and economic uncertainties that are inherent in the scaling up phase to commercial size retort and mining operations. Under the present economic, political and technical environment, the financial burden and risks are too great to bear alone. Additional time is needed to establish a joint industry/government program to fund the advancement of oil shale technology to the demonstration stage. Such a program should insure the demonstration of a wide range of technologies for shale processing by the construction and operation of a carefully considered number of modules. These modules would allow for demonstration and evaluation of the technology using full commercial-scale equipment. A module would most probably be a single retort coupled with attendant mining and other required supportive facilities. The demonstration phase will provide a sound base for predicting capital, environmental, and operational costs for a commercial facility. Information gained from the modular approach can be expected to suggest modifications to mining, retorting, and environmental protection techniques which would improve the overall conservation of the resource.

SUMMARY

A suspension of operations and production under the Lease as herein requested is required to allow Applicants: (1) to determine whether or not it is possible to comply with the required air quality standards in the planned development of Tract U–a; (2) time to consider the various alternatives which would allow a greater recovery of the oil shale from the leased lands; and (3) to allow establishment of a demonstration program leading to the development of a retort process which could be commercially feasible.

During such period of suspension, the oil shale could be conserved while Applicants gather and evaluate all data for the purpose of adopting a feasible plan of mining and processing the oil shale while environmental and economic conditions permit.

Applicants respectfully request that suspension of operations and production under the Lease including, without limitation, extension of the term of the Lease and suspension of the following Lease terms for a period of 24 months be approved effective July 1, 1976, unless Applicants elect to resume operations prior to that date:

1. The due dates for payment of the fourth and fifth bonus installments and the dates by which expenditures to be credited against such payments must be made; and

2. The due dates for calculation and payment of minimum royalties and the escalation thereof.

Notwithstanding approval of this Application, Applicants would complete the second year of the environmental base line program, continue the environmental monitoring program at a reduced level, and the approved exploration program, but any other "due diligence" requirements of the Lease would be suspended except for operations, if any, required by the detailed development plan heretofore filed.

Attached hereto as Exhibit "A" is a paper entitled "White River Shale Project Position Paper on Oil Shale Development."

Applicants will furnish any available data or information if so requested by the Secretary of the Interior in support of this Application.

Signed this 19th day of July, 1976.

PHILLIPS PETROLEUM CO.,
324–A Frank Phillips Building,
Bartlesville, Okla.
By W. P. BOHON,
Attorney-in-Fact.

SUNOCO ENERGY DEVELOPMENT CO.,
12700 Park Central, Suite 1500,
Dallas, Tex.
By W. M. QUENTSLY,
President.

U.S. DEPARTMENT OF THE INTERIOR

APPLICATION FOR SUSPENSION OF OPERATIONS AND PRODUCTION UNDER OIL SHALE LEASE SERIAL U–26194

Pursuant to Section 39 of the Mineral Leasing Act (30 U.S.C. 209), the undersigned, Sohio Petroleum Company (herein called "Applicant"), hereby makes application to the Secretary of the Interior for a suspension of operations and production under Oil Shale Lease ("Lease"), originally entered into between the United States of America, as Lessor, and White River Shale Oil Corporation (herein called "White River"), as Lessee, effective June 1, 1974, Serial No. U–26194, Tract U–b, covering the following lands situated in Uintah County, State of Utah:

Township 10 South, Range 24 East, S.L.M., Utah

Section 12: S1/2, S1/2N1/2; section 13: All; section 14: All; section 23: All; section 24: All; section 25: W1/2W1/2; section 26; All.

Township 10 South, Range 25 East, S.L.M., Utah

Section 18: All; section 19: All.

(Containing 5,120 acres, more or less.)

On December 30, 1975, the interest of White River in said Lease was assigned to Sohio, and approved by the Bureau of Land Management effective June 1, 1976.

Immediately after the effective date of the Lease, Sohio and the Lessees of Oil Shale Lease, Serial U–25918, Tract U–a, formed the White River Shale Project ("Project") for the purpose of establishing a plan for the joint development of Tracts U–a and U–b. Phillips Petroleum Company and Sunoco Energy Development Company are the lessees under the lease covering Tract U–a. The objectives of the Project were to evaluate various technological approaches which could be used to mine by underground means, the rock from the leased lands and to develop a process to extract the shale oil therefrom, all in an orderly manner.

As grounds for support of this Application for Suspension, Applicants respectfully submit the following:

I. AIR QUALITY

During the course of undertaking the base line studies required of Applicant under the terms of the Lease, Applicant has determined that the air quality of the area where Tract U–b is located exceeds the national standards of the Clean Air Act (42 U.S.C. §§ 1857, *et seq.*). See Applicant's Detailed Development Plan, Volume 1, Part 2, Section 2.4, subsection 2.4.3.1, Gaseous Pollutants, and Applicant's First Year Environmental Baseline Report, Volume I, Part III. C.1, Gaseous Pollutants.

There is currently pending before the United States Congress certain bills which seek to amend the Clean Air Act. The final outcome of this legislation could determine whether or not Applicant, as Lessee, could comply with the air quality standards which would be required by such legislation, if enacted.

II. RECOVERY OF CRUDE OIL SHALE

There are approximately 510,000,000 barrels of shale oil contained in 28 gallons per ton oil shale on Tract U–b, and the Project seeks to recover approximately 70% of this resource, or 357,000,000 barrels, by underground mining. However, the current economic and technical environment has rendered unfeasible the recovery of shale oil from shale averaging only 28 gallons per ton. Yet if the Project were forced by economics to mine a richer ore zone, the overall recovery from the leased land would be reduced. At the present time, an economically viable operation does not appear feasible, however, as an example, if by mining only shale averaging 34 gallons per ton were feasible, then the ultimate recovery would be reduced by 126,000,000 barrels. Moreover, mining of the higher grade zone would probably eliminate later economic mining of the remaining lower grade shale, thereby causing a substantial, permanent reduction in overall resource recovery from the leased land.

III. MINING AND RETORTING TECHNOLOGY

The present stage of mining and retorting technology is not adequate to allow Applicant to proceed directly into commercial development. Much more information is needed to satisfactorily resolve the many technical and economic uncertainties that are inherent in the scaling up phase to commercial size retort and mining operations. Under the present economic, political and techical environment, the financial burden and risks are too great to bear alone. Additional time is needed to establish a joint industry/government program to fund the advancement of oil shale technology to the demonstration stage. Such a program should insure the demonstration of a wide range of technologies for shale processing by the construction and operation of a carefully considered number of modules. These modules would allow for demonstration and evaluation of the technology using full commercial-scale equipment. A module would most probably be a single retort coupled with attendant mining and other required supportive facilities. The demonstration phase will provide a sound base for predicting capital, environmental, and operational costs for a commercial facility. Information gained from the modular approach can be expected to suggest modifications to mining, retorting, and environmental protection techniques which would improve the overall conservation of the resource.

SUMMARY

A suspension of operations and production under the Lease as herein requested is required to allow Applicant: (1) to determine whether or not it is possible to comply with the required air quality standards in the planned development of Tract U–b; (2) time to consider the various alternatives which would allow a greater recovery of the oil shale from the leased lands; and (3) to allow establishment of a demonstration program leading to the development of a retort process which could be commercially feasible.

During such period of suspension, the oil shale could be conserved while Applicant gathers and evaluates all data for the purpose of adopting a feasible plan of mining and processing the oil shale when economic conditions permit.

Applicant respectfully requests that suspension of operations and production under the Lease including, without limitation, extension of the term of the Lease and suspension of the following Lease terms for a period of 24 months be approved effective July 1, 1976, unless Applicant elects to resume operations prior to that date:

1. The due dates for payment of the fourth and fifth bonus installments and the dates by which expenditures to be credited against such payments must be made; and

2. The due dates for calculation and payment of minimum royalties and the escalation thereof.

Notwithstanding approval of this Application, Applicant would complete the second year of the environmental base line program, continue the environmental monitoring program at a reduced level, and the approved exploration program, but any other "due diligence" requirements of the Lease would be suspended except for operations, if any, required by the detailed development plan heretofore filed.

Attached hereto as Exhibit "A" is a paper entitled "White River Shale Project Position Paper on Oil Shale Development."

Applicant will furnish any available data or information if so requested by the Secretary of the interior in support of this Application.

Signed this 19th day of July, 1976.

SOHIO PETROLEUM CO.,
300 Enterprise Building
Third and Main Streets
Grand Junction, Colo.
By H. PFORZHEIMER,
Vice President.

Appendix II

Responses to Questions Submitted by Senator Metcalf to Dr. Philip C. White

DECEMBER 6, 1976.

DR. PHILLIP C. WHITE,
Assistant Administrator for Fossil Energy, Energy Research and Development Administration, 20 Massachusetts Avenue NW., Washington, D.C.

DEAR MR. WHITE: Thank you for appearing before the Subcommittee on 30 November to discuss the future outlook for oil shale development.

We have some additional questions which are enclosed. Please submit your response by 26 December so that it can be included in the official record of the hearing.

Thank you very much for your cooperation.

Very truly yours,

LEE METCALF,
Chairman, Subcommittee on Minerals, Materials and Fuels.

1. You mentioned that ERDA is presently negotiating four *in situ* contracts. The total FY 1977 funding for those projects is approximately $8.04 million.

(1) Under your present schedule, what should be the approximate funding for these contracts in FY 1978?

(2) Will the President's budget request that amount?

(3) From your testimony, ERDA anticipates an oil shale program in which demonstration of *in situ* and above ground recovery will occur at approximately the same time and the possibility exists that above ground recovery methods could be compined with a modified *in situ* method. Is this concurrent development contingent upon continued and increased funding in FY 1978 for the four *in situ* contracts now being negotiated?

2. In September ERDA requested this Committee's approval for a reprogramming of $2.4 million to participate in a joint ERDA/Navy/Industry project to recover by above ground method and refine into military specification, fuels 100,000 barrels of crude oil from shale.

(1) Would you describe for the record the provisions of that proposal and the need for ERDA's participation?

(2) In light of the letter sent to Dr. Seamans by the Chairman of this Committee informing ERDA that approval, prior to the expiration of 30 days from date of request, could not be granted without further consideration by all Committee members, can you tell us what the Navy has done to further this project and what ERDA intends to do once the new Congress convenes?

(3) There has been considerable controversy over the sole source nature of the contract awarded to Development Engineering, Inc.

(A) Are there others who could have supplied the oil?

(B) Why was this particular company chosen?

(C) Is the refining of the oil to be obtained on a competitive bid basis?

(D) Can the refining be done at an existing refinery?

(E) If this whole program is funded by the Navy and ERDA or the Navy alone, what will be the total cost?

(F) Can you tell the Committee if it is true that provisions of two contracts already negotiated between the Navy and Development Engineering, Inc., provide that the contractor shall retain all patent rights in any discoveries made in the course of a project in which the Government foots the entire bill?

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION,
Washington, D.C., January 12, 1977.

HON. LEE METCALF,
Chairman, Subcommittee on Minerals, Materials, and Fuels, Committee on Interior and Insular Affairs, U.S. Senate.

DEAR MR. CHAIRMAN: This is in response to your letter of December 6 regarding additional questions on the future outlook for oil shale development. For ease of presentation, the questions are repeated, followed by the ERDA response.

Question 1. You mentioned that ERDA is presently negotiating four in situ contracts. The total FY 1977 funding for those projects is approximately $8.04 million.

(1) Under your present schedule, what should be the approximate funding for these contracts in FY 1978?

Answer. The total amount of money available for funding the PON contracts in FY 1977 is higher than the $8.04 million because of previous transfers of FY 1976 funds ($4.368 million) for use in support of these contracts. Total money available for FY 1977 is, therefore, $12.408 million. An additional $15.1 million will be needed for FY 1978 which represents an increase of about 18 percent over the 1977 funding level.

(2) Will the President's budget request that amount?

Answer. The budget requested by this office and sent to OMB was based on actual anticipated funding needs. However, the new budget has not been finalized; therefore, it is not known at this time what the final request will contain.

(3) From your testimony, ERDA anticipates an oil shale program in which demonstration of in situ and aboveground recovery will occur at approximately the same time and the possibility exists that aboveground recovery methods could be combined with a modified in situ method. Is this concurrent development contingent upon continued and increased funding in FY 1978 for the four in situ contracts now being negotiated?

Answer. Development of concurrent technologies, which includes both modified in situ and aboveground retorting, require that a development and demonstration of at least one of the modified in situ processes involving conventional mining be initiattd in FY 1977. One of the modified in situ retorting projects being negotiated as a result of PON No. 2 is the major project being considered for a combined development program. For this reason, continued funding of this project under PON No. 2 is essential to demonstration of the concurrent surface and in situ technologies. The major benefit of this joint demonstration would be the vital economic and materials handling data that would be developed in support of both in situ and aboveground technologies which would greatly assist any decision for commercialization in the early 1980's.

Question 2. In September, ERDA requested this Committee's approval for a reprogramming of $2.4 million to participate in a joint ERDA/Navy/Industry project to recover by aboveground methods, and refine into military specification fuels, 100,000 barrels of crude oil from shale.

(1) Would you describe, for the record, the provisions of that proposal and the need for ERDA's participation?

Answer. ERDA personnel have developed expertise in both retorting and refining that are essential to proper monitoring of a project for production and refining of large quantities of shale oil. This program involves the extraction and processing of approximately 100,000 barrels of crude shale oil from shale at the Naval Oil Shale Reserve in Colorado using the Paraho process. The principal objectives are to produce, from oil shale derived crude oil, a sufficient quantity of full specification military fuels to allow thorough analysis, to study optimum operating parameters for its production, and to test the fuel's compatibility and operational characteristics in military equipment.

The goal of the program is to use current military specifications for JP–4, JP–5, JP–8, DFM and NATO motor gasoline for the refined fuels, with acceptance at the refinery made in accordance with existing Defense Fuel Supply Center procedures. It is recognized that, in view of the developmental nature of the project, some adjustments to these specifications may be required.

Predevelopment plans are being formulated by the Navy Petroleum and Oil Shale Reserve Office to develop U.S. oil shale deposits. The jointly funded DOD/ERDA program will provide useful information in support of the predevelopment plan. Continuation of the Paraho Oil Shale Research Project, of which Development Engineering, Inc., is the operating unit, offers unique opportunities for meeting initial DOD synfuel requirements and for further development of manufacturing technology under ERDA regulation.

(2) In light of the letter sent to Dr. Seamans by the Chairman of this Committee informing ERDA that approval, prior to the expiration of 30 days from the date of request, could not be granted without further consideration by all Committee members, can you tell us what the Navy has done to further this project and what ERDA intends to do once the new Congress convenes?

Answer. The Navy has awarded several contracts to DEI for increasing on-site oil storage capacity, mine preparation, precommissioning and startup of the facility, and initiation of shale oil production and R&D on shale retorting technology.

Meetings have been held with industry preparatory to issuing an RFP for the refining phase of the work. The call for bids is planned for early 1977. ERDA considers this project an unique opportunity to participate in a joint effort with DOD to provide critical data on the refining and testing of oil shale for future military applications. Therefore, as soon as the new Congress convenes, ERDA will vigorously pursue action seeking formal approval of the $2.4 million reprogramming request.

(3) There has been considerable controversy over the sole source nature of the contract awarded to Development Engineering, Inc.

(a) Are there others who could have supplied the oil?

(b) Why was this particular company chosen?

Answer. The Navy, in order to comply with its statutory responsibilities relating to the use and operation of the Naval Petroleum Reserves, of which the Anvil Points property is a part, decided it was necessary to test the shale from the reserve to confirm that military specification fuels could be produced. At this time, the mining and operating facilities at Anvil Points are being leased to DEI. Prior work by this operator (industry funded research) and demonstrated that they could produce large quantities of shale oil. In addition. a previous Government contract had resulted in the semi-successful refining of Paraho retort produced crude oil. In order to extend the evaluation begun under the initial 10,000 barrel refining project, to allow ERDA technical personnel to pursue further research efforts aimed toward evaluation of this technology, and for the reasons previously listed, it was determined that DEI was the only source that could meet the Government's current requirement in a timely fashion.

(c) Is the refining of the oil to be obtained on a competitive bid basis?

Answer. A call for competitive bids for the refining phase of the project is scheduled for early calendar year 1977.

(d) Can the refining be done at an existing refinery?

Answer. On the basis of considerable interest already expressed by industry to refine 100,000 barrels of shale oil, as evidenced by the large attendance of industry participants at the two meetings held (Denver, November 10, 1976; and Washington, December 2, 1976) and subsequent communications, and also on the basis of the experience gained in the previous (1975) refining of 10,000 barrels of shale oil, we have every reason to believe that a fully competent existing refiner can be selected to successfully carry out the required effort.

(e) If this whole program is funded by the Navy and ERDA or the Navy alone, what will be the total cost?

Answer. Four levels of the refining program are being considered depending on the allowable funding level.

(1) Navy alone—This would be an $8.1 mililon program for 60,000 barrels. Although this would constitute a major advance over the 10,000 barrel program, it would not provide the quantity of fuel considered necessary for much of the desired testing program.

(2) Navy plus ERDA (2.4 million)—This would be a $10.5 million program which would allow some R&D and 80,000 barrels of oil.

(3) At $12.3 million, the program would allow 100,000 barrels of oil to be refined and a modest R&D effort.

(4) Original planning called for $14.2 million. This level would allow the refining of 100,000 barrels of shale oil plus an extensive but very necessary R&D program to define process variables.

(f) Can you tell the committee if it is true that provisions of two contracts already negotiated between Navy and Development Engineering, Inc., provide that the contractor shall retain all patent rights in any discoveries made in the course of a project in wdich the Government foots the entire bill?

Answer. Because of the nature of the work involved in the two contracts it seems inconceivable that any patents could be produced as a result. One contract is for the refurbishment of facilities involving merely repair of machinery, repiping or replacement of corroded lines, and other essentially normal repairs that would be expected before conducting a major effort on any mechanical facility that has seen intermittent use over a period of over two decades. The second contract covers the startup and check-out of the facility and is to serve as the basis for establishing costs for the remainder of the project. During this period the retort will be operated according to conditions established in early, industry-funded research. No research is planned during this period. Any new findings that might result would be only improvements on existing technology and would

be covered under 9–107.2 part b of the Armed Services Procurement Regulation which states:

"(b) In other situations, where the purpose of the contract is to build upon existing knowledge or technology to develop information, products, processes, or methods for use by the Government, and the work called for by the contract is in a field of technology in which the contractor has acquired technical competence (demonstrated by factors such as know-how, experience, and patent position) directly related to an area in which the contractor has an established nongovernmental commercial position, the contractor shall normally retain the principal or exclusive rights throughout the world in and to any resulting inventions."

Under the contracts where rights in technical data resulting from the work is involved, the ERDA's request for the rights to this data for use and publication has been negotiated and appropriate contract coverage allowing ERDA's rights have been included. A copy of the appropriate Armed Services Procurement Regulation is enclosed.

If you have any further questions concerning the reprogramming request after review of this material please let us know.

Sincerely,

PHILIP C. WHITE,
Assistant Administrator for Fossil Energy.

Enclosures.

7–302.23

ARMED SERVICES PROCUREMENT REGULATION

CONTRACT CLAUSES AND SOLICITATION PROVISIONS [JULY 1, 1976]

* * * * * * *

PATENT RIGHTS—RETENTION BY THE CONTRACTOR (LONG FORM) [AUG. 1975]

(*a*) *Definitions.*

(1) "*Subject Invention*" means any invention or discovery of the Contractor conceived or first actually reduced to practice in the course of or under this contract, and includes any art, method, process, machine, manufacture, design, or composition of matter, or any new and useful improvement thereof, or any variety of plant, which is or may be patentable under the Patent Laws of the United States of America or any foreign country.

(2) "*Contract*" means any contract, agreement, grant, or other arrangement, or subcontract entered into with or for the benefit of the Government where a purpose of the contract is the conduct of experimental, developmental, or research work.

(3) "*States and domestic municipal governments*" means the States of the United States, the District of Columbia, Puerto Rico, the Virgin Islands, American Samoa, Guam, the Trust Territory of the Pacific Islands, and any political subdivision and agencies thereof.

(4) "*Government agency*" includes an executive department, independent commission, board, office, agency, administration, authority, Government corporation, or other Government establishment of the executive branch of the Government of the United States of America.

(5) "*To bring to the point of practical application*" means to manufacture in the case of a composition or product, to practice in the case of a process, or to operate in the case of a machine and under such conditions as to establish that the invention is being worked and that its benefits are reasonably accessible to the public.

(*b*) *Allocation of principal rights*

(1) The Contractor may retain the entire right, title, and interest throughout the world or any country thereof in and to each Subject Invention disclosed pursuant to paragraph (e)(2)(i) of this clause, subject to the rights obtained by the Government in paragraph (c) of this clause. The Contractor shall include with each Subject Invention disclosure an election as to whether he will retain the entire right, title, and interest in the invention throughout the world or any country thereof.

(2) Subject to the license specified in paragraph (d) of this clause, the Contractor agrees to convey to the Government, upon request, the entire domestic right, title, and interest in any Subject Invention when the Contractor:

(i) does not elect under paragraph (b)(1) of this clause to retain such rights; or

(ii) fails to have a United States patent application filed on the invention in accordance with paragraph (j) of this clause, or decides not to continue prosecution of such application; or

(iii) at any time, no longer desires to retain title.

(3) Subject to the license specified in paragraph (d) of this clause, the Contractor agrees to convey to the Government, upon request, the entire, right, title, and interest in any Subject Invention in any foreign country when the Contractor:

(i) does ot elect under paragraph (b)(1) of this clause to retain such rights in the country; or

(ii) fails to have a patent application filed in the country on the invention in accordance with paragraph (k) of this clause, or decides not to continue prosecution or to pay any maintenance fees covering the invention. To avoid forfeiture of the patent application or patent, the Contractor shall notify the Contracting Officer not less than sixty (60) days before the expiration period for any action required by the foreign patent office.

(4) A conveyance, requested pursuant to paragraph (b)(2) or (3) of this clause, shall be made by delivering to the Contracting Officer duly executed instruments (prepared by the Government) and such other papers as are deemed necessary to vest in the Government the entire right, title and interest to enable the Government to apply for and prosecute patent applications covering the invention in this or the foreign country, respectively, or otherwise establish its ownership of such invention.

(c) *Minimum rights acquired by the Government.* With respect to each Subject Invention to which the Contractor retains principal or exclusive rights, the Contractor:

(i) hereby grants to the Government a nonexclusive, nontransferable, paid-up license to make, use, and sell each Subject Invention throughout the world by or on behalf of the Government of the United States (including any Government agency) and the States and domestic municipal governments;

(ii) agrees to grant to responsible applicants, upon request of the Government, a license on terms that are reasonable under the circumstances;

(A) unless the Contractor, his license, or his assignee, demonstrates to the Government that effective steps have been taken within three (3) years after a patent issues on such invention to bring the invention to the point of practical application or that the invention has been made available for licensing royalty-free or on terms that are reasonable in the circumstances, or can show cause why the principal or exclusive rights should be retained for a further period of time; or

(B) to the extent that the invention is required for public use by governmental regulations or as may be necessary to fulfill public health, welfare or safety needs, or for other public purposes stipulated in this contract;

(iii) shall submit written reports at reasonable intervals, upon request of the Government, during the term of the patent on the Subject Invention, regarding:

(A) the commercial use that is being made or is intended to be made of such invention; and

(B) the steps taken by the Contractor or his transferee to bring the invention to the pont of practical application, or to make the invention available for licensing;

(iv) agrees to arrange, when licensing any subject inventions, to avoid royalty charges on procurements involving Government funds, including funds derived through the Military Assistance Program of the Government or otherwise derived through the Government, and to refund any amounts received as royalty charges on any Subject Invention in procurements for, or on behalf of, the Government, and to provide for such refund in any instrument transferring rights in such invention to any party; and

(v) agrees to provide for the Government's paid-up license pursuant to paragraph (c)(i) of this clause in any instrument transferring rights in a Subject Invention and to provide for the granting of licenses as required by (c)(ii) of this clause, and for the reporting of utilization information as required by paragraph (c)(iii) of this clause whenever the instrument transfers principal or exclusive rights in any Subject Invention.

Nothing contained in this paragraph (c) shall be deemed to grant to the Government any rights with respect to any invention other than a Subject Invention.

(d) *Minimum rights to the Contractor*

(1) The Contractor reserves a revocable, nonexclusive, royalty-free license in each patent application filed in any country on a Subject Invention and any resulting patent in which the Government acquires title. The license shall extend to the Contractor's domestic subsidiaries and affiliates, if any, within the corporate structure of which the Contractor is a part and shall include the right to grant sublicenses of the same scope to the extent the Contractor was legally obligated to do so at the time the contract was awarded. The license shall be transferable only with approval of the Contracting Office, except when transferred to the successor of that part of the Contractor's business to which the invention pertains.

(2) The Contractor's domestic nonexclusive license retained pursuant to paragraph (d)(1) of this clause may be revoked or modified to the extent necessary to achieve expeditious practical application of the Subject Invention. The license shall not be revoked in that field of use and/or the geograhical areas in which the contractor has brought the invention to the point of practical application and continues to make the benefits of the invention reasonably accessible to the public. The Contractor's nonexclusive license in any foreign country reserved pursuant to paragraph (d)(1) of this clause may be revoked or modified at the discretion of the Contracting Officer to the extent the Contractor or his domestic subsidiaries or affiliates have failed to achieve the practical application of the invention in such foreign country.

(3) Before modification or revocation of the license, pursuant to paragraph (d)(2) of this clause, the Contractor shall be given written notice of the intent to modify or revoke the license and shall be allowed thirty (30) days or such longer period as may be authorized by the Contracting Officer for good cause shown in writing by the Contractor after such notice to show cause why the license should not be modified or revoked. The Contractor shall have the right to contest any decision concerning the modification or revocation of the license in accordance with Departmental inventions licensing regulations.

(c) *Invention identification, disclosures and reports*

(1) The Contractor shall establish and maintain active and effective procedures to assure that Subject Inventions are promptly identified and timely disclosed. These procedures shall include the maintenance of laboratory notebooks or equivalent records and other records as are reasonably necessary to document the conception and/or the first actual reduction to practice of Subject Inventions, and records which show that the procedures for identifying and disclosing the inventions are followed. Upon request, the Contractor shall furnish the Contracting Officer a description of such procedures so that he may evaluate and determine their effectiveness.

(2) The Contractor shall furnish the Contracting Officer:

(i) a complete technical disclosure for each Subject Invention, within six (6) months after conception or first actual reduction to practice, whichever occurs first in the course of or under the contract, but in any event prior to any on sale, public use, or publication of such invention known to the Contractor. The disclosure shall identify the contract and inventor(s) and be sufficiently complete in technical detail and appropriately illustrated by sketch or diagram to convey to one skilled in the art to which the invention pertains, a clear understanding of the nature, purpose, operation, and to the extent known, the physical, chemical, biological, or electrical characteristics of the invention;

(ii) interim reports, preferably on DD Form 882, at least every twelve (12) months from the date of the contract listing Subject Inventions during that period and certifying that:

(A) the Contractor's procedures for identifying and disclosing Subject Inventions as required by this paragraph (e) have been followed throughout the reporting period; and

(B) all Subject Inventions have been disclosed or that there are no such inventions; and

(iii) a final report, preferably on DD Form 882, within three (3) months after completion of the contract work, listing all Subject Inventions or certifying that there were no such inventions.

(3) The Contractor shall obtain patent agreements to effectuate the provisions of this clause from all persons in his employ who perform any part of the work under this contract except nontechnical personnel, such as clerical and manual labor personnel.

(4) The Contractor agrees that the Government may duplicate and disclose Subject Invention disclosures and all other reports and papers furnished or required to be furnished pursuant to this clause.

(f) *Forfeiture of rights in unreported Subject Inventions*

(1) The Contractor shall forfeit to the Government all rights in any Subject Inventions which he fails to disclose to the Contracting Officer within six (6) months after the time he:

(i) files or causes to be filed a United States or foreign application thereon, or

(ii) submits the final report required by paragraph (e)(2)(iii) of this clause, whichever is later.

(2) However, the Contractor shall not forfeit rights in a Subject Invention if, within the time specified in (1)(i) or (1)(ii) of this paragraph (f), the Contractor:

(i) prepared a written decision based upon a review of the record that the invention was neither conceived nor first actually reduced to practice in the course of or under the contract; or

(ii) contending that the invention is not a Subject Invention, he nevertheless discloses the invention and all facts pertinent to his contention to the Contracting Officer; or

(iii) establishes that the failure to disclose did not result from his fault or negligence.

(3) Pending written assignment of the patent applications and patents on a Subject Invention determined by the Contracting Officer to be forfeited (such determination to be a final decision under the Disputes clause), the Contractor shall be deemed to hold the invention and the patent applications and patents thereto in trust for the Government. The forfeiture provision of this paragraph (f) shall be in addition to and shall not supersede other rights and remedies which the Government may have with respect to Subject Inventions.

(g) *Examination of records relating to inventions*

(1) The Contracting Officer or his authorized representative shall, until the expiration of three (3) years after final payment under this contract, have the right to examine any books (including laboratory notebooks), records, documents, and other supporting data of the Contractor which the Contracting Officer reasonably deems pertinent to the discovery or identification of Subject Inventions or to determine compliance with the requirements of this clause.

(2) The Contracting Officer shall have the right to review all books (including laboratory notebooks), records, and documents of the Contractor relating to the conception or first actual reduction to practice of inventions in the same field of technology as the work under this contract, to determine whether any such inventions are Subject Inventions if the Contractor refuses or fails to:

(i) establish the procedures of paragraph (e)(1) of this clause; or

(ii) maintain and follow such procedures; or

(iii) correct or eliminate any material deficiency in the procedures within thirty (30) days after the Contracting Officer notifies the Contractor of such a deficiency.

(h) *Withholding of payment (not applicable to subcontracts)*

(1) Any time before final payment of the amount of this contract, the Contracting Officer may, if he deems such action warranted, withhold payment until a reserve not exceeding $50,000 or five percent (5%) of the amount of this con-

tract, whichever is less, shall have been set aside if in his opinion the Contractor fails to:

(i) establish, maintain and follow effective procedures for identifying and disclosing Subject Inventions pursuant to paragraph (e)(1) of this clause; or

(ii) disclose any Subject Invention pursuant to paragraph (e)(2)(i) of this clause; or

(iii) deliver acceptable interim reports pursuant to paragraph (e)(2)(ii) of this clause; or

(iv) provide the information regarding subcontracts pursuant to paragraph (i)(5) of this clause.

Such reserve or balance shall be withheld until the Contracting Officer has determined that the Contractor has rectified whatever deficiencies exist and has delivered all reports, disclosures, and other information required by this clause.

(2) Final payment under this contract shall not be made before the Contractor delivers to the Contracting Officer all disclosures of Subject Inventions required by paragraph (e)(2)(i) of this clause, an acceptable final report pursuant to (e)(2)(iii) of this clause and all past due confirmatory instruments.

(3) The Contracting Officer may, in his discretion, decrease or increase the sums withheld up to the maximum authorized above. If the Contractor is a nonprofit organization, the maximum amount that may be withheld under this paragraph shall not exceed $50,000 or one percent (1%) of the amount of this contract, whichever is less. No amount shall be withheld under this paragraph while the amount specified by this paragraph is being withheld under other provisions of the contract. The withholding of any amount or subsequent payment thereof shall not be construed as a waiver of any rights accruing to the Government under this contract.

(i) *Subcontracts*

(1) For the purpose of this paragraph, the term "*Contractor*" means the party awarding a subcontract and the term "*Subcontractor*" means the party being awarded a subcontract, regardless of tier.

(2) The Contractor shall include an ASPR patent rights clause determined by the Contrator to be in accordance with the policy expressed ASPR 9–107.2 in every subcontract hereunder having as a purpose the conduct of experimental, developmental, or research work, unless the Contractor is directed by the Government Contracting Officer to include a particular clause. In the event of refusal by a subcontractor to accept such clause, the Contractor:

(i) shall promptly submit a written notice to the Government Contracting Officer setting forth the subcontractor's reasons for such refusal and other pertinent information which may expedite disposition of the matter; and

(ii) shall not proceed with the subcontract without the written authorization of the Government Contracting Officer.

(3) The Contractor shall not, in any subcontract or by using a subcontract as consideration therefor, acquire any rights in his subcontractor's Subject Invention for his own use (as distinguished from such rights as may be required solely to fulfill his contract obligations to the Government in the performance of this contract).

(4) All invention disclosures, reports, instruments, and other information required to be furnished by the subcontractor to the Government Contracting Officer under the provisions of a patent right clause in any subcontract hereunder may, in the discretion of the Government Contracting Officer, be furnished to the Contractor for transmission to the Government Contracting Officer.

(5) The Contractor shall promptly notify the Government Contracting Officer in writing upon the award of any subcontract containing a patent rights clause by identifying the subcontractor, the applicable patent rights clause, the work to be performed under the subcontract, and the dates of award and estimated completion. Upon request of the Government Contracting Officer, the Contractor shall furnish a copy of the subcontract. If there are no subcontracts containing patent rights clauses, a negative report shall be included in the final report submitted pursuant to paragraph (e)(2)(iii) of this clause.

(6) The Contractor shall exert his best effort to identify all Subject Inventions of the subcontractor and shall notify the Government Contracting Officer promptly upon the identification of such inventions.

(7) It is understood that the Government is a third party beneficiary of any subcontract clause granting rights to the Government in Subject Inventions, and

the Contractor hereby assigns to the Government all rights that he would have to enforce the subcontractor's obligations for the benefit of the Government with repsect to Subject Inventions. The Contractor shall not be obligated to enforce the agreements of any subcontractor hereunder relating to the obligations of the subcontractor to the Government in regard to Subject Inventions.

(*j*) *Filing of domestic patent applications*

(1) With respect to each Subject Invention in which the Contractor elects to retain domestic rights pursuant to paragraph (b) of this clause, the Contractor shall have a domestic patent application filed within six (6) months after submission of the invention disclosure pursuant to paragraph (e)(2)(i) of this clause, or such longer period as may be approved in writing by the Contracting Officer for good cause shown in writing by the Contractor. With respect to such invention, the Contractor shall promptly notify the Contracting Officer of any decision not to file an application.

(2) For each Subject Invention on which a patent application is filed by or on behalf of the Contractor, the Contractor shall:

(i) within two (2) months after such filing, or within two (2) months after submission of the invention disclosure if the patent application previously has been filed, deliver to the Contracting Officer a copy of the application as filed, including the filing date and serial number;

(ii) include the following statement in the second paragraph of the specification of the application and any patents issued on the Subject Invention, "The Government has rights in this invention pursuant to Contract (or Grant) No. _____ awarded by (*identify the Department*)";

(iii) within six (6) months after filing the application, or within (6) months after submitting the invention disclosure if the application has been filed previously, deliver to the Contracting Officer a duly executed and approved instrument on the form specified in ASPR 9–109.5(b) fully confirmatory of all rights to which the Government is entitled, and provide the Government an irrevocable power to inspect and make copies of the patent application file;

(iv) provide the Contracting Officer with a copy of the patent within two (2) months after a patent issues on the application; and

(v) not less than thirty (30) days before the expiration of the response period for any action required by the Patent and Trademark Office, notify the Contracting Officer of any decision not to continue prosecution of the application and deliver to the Contracting Officer executed instruments granting the Government a power of attorney.

(3) For each Subject Invention in which the Contractor initially elects not to retain principal domestic rights, the Contractor shall inform the Contracting Officer promptly in writing of the date and identity of any on sale, public use, or publication of such invention which may constitute a statutory bar under 35 U.S.C. 102, which was authorized by or known to the Contractor, or any contemplated action of this nature.

(*k*) *Filing for foreign patent applications*

(1) With respect to each Subject Invention in which the Contractor elects to retain principal rights in a foreign country pursuant to paragraph (b)(1) of this clause, the Contractor shall have a patent application filed on the inveniton in such country, in accordance with applicable statutes and regulations, and within one of the following periods:

(i) eight (8) months from the date of a corresponding United States application filed by or on behalf of the Contractor; or if such an application is not filed, six (6) months from the date the invention is submitted in a disclosure pursuant to paragraph (e)(2)(i) of this clause;

(ii) six (6) months from the date a license is granted by the Commissioner of Patents and Trademarks to file foreign applications when such filing has been prohibited by security reasons; or

(iii) such longer period as may be approved in writing by the Contracting Officer.

(2) The Contractor shall notify the Contracting Officer promptly of each foreign application filed and, upon written request, shall furnish an English version of such foreign application with additional compensation.

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9–107.1

ARMED SERVICES PROCUREMENT REGULATION

PATENTS, DATA, AND COPYRIGHTS

[1 JULY 1976]

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9–107.1 *General.*

(a) *Introduction.* On August 23, 1971, the President issued a Statement of Government Patent Policy (36 Fed. Reg. 16887, August 26, 1971) applicable to all executive departments and agencies, revising a prior Statement of Policy (28 Fed. Reg. 10943, October 12, 1963). Essentially, the goals of this Statement are to provide criteria for determining the allocation of rights in inventions resulting from federally-sponsored research and development contracts, to promote their expeditious development so that the public can benefit from early civilian use of the inventions and to assure their continued availability. In applying this regulation, both the need for incentives to draw forth private initiatives and the need to promote healthy competition in industry must be weighed.

(b) *Applicable Statutes.* Except to the extent that the Deparment of Defense may be governed by specific statutes or by any treaty or agreement between the United States and any foreign country, inconsistent with this paragraph 9–107, the provisions of this paragraph 9–107, including the use of the prescribed clauses shall be followed.

(c) *Co-sponsored, Cost Sharing or Joint Venture Research.* The provisions of this paragraph 9–107 are not mandatorily applicable to co-sponsored, cost-sharing or joint venture research when it is determined that in the course of the work under the contract, the contractor will be required to make a substantial contribution of funds, facilities, or equipment to the principal purpose of the contract.

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Appendix III

Additional Statements and Communications Submitted for the Record

PREPARED STATEMENT OF CHARLES H. BROWN, SENIOR VICE PRESIDENT, TOSCO CORPORATION

I am pleased to submit this statement on behalf of Tosco Corporation, and I will use the opportunity to provide a brief description of our company and its efforts in oil shale development, to discuss the potential of oil shale as a new energy resource, and to share with you our analysis of the present obstacles to commercial development of oil shale.

We consider Tosco to be a new kind of independent energy company, geared for both the near term and long term. Near term, we are petroleum refiners and marketers with annual sales of more than $1 billion, processing domestic and foreign crudes purchased under long term contract from independent suppliers, such as Getty, Aminoil, Phillips, Natomas and independent producers in Arkansas and California. Long term, we have broadly based new-source energy capabilities in coal, oil shale and hydrocarbon waste materials.

Our company planning is based on a fact of life which we accepted in the early 60's, long before the Arab embargo or the FEA or the naive term "Project Independence." The simple fact is that the United States, and indeed the world, are running out of oil produced by traditional methods relative to the wordl's needs. The future will belong to the creative and resourceful energy companies.

In 1976, U.S. oil production has been less than in 1975; 1975 was 421,000 barrels per day less than 1974; and 1974 was 444,000 barrels per day less than 1973. In 1977, reliable forecasts indicate that the U.S. will have to import almost 8 million barrels of oil per day—an amount equal to our total domestic production in 1976. The dollar outflow will be more than $30 billion a year, and growing.

Even with Alaskan production and maximum offshore drilling, even with smaller cars and strenuous conservation efforts, this potentially explosive dollar outflow will continue; and in ten to fifteen years, the oil exporting countries of the non-communist world will, themselves, be rationing oil among favored customers, because even their vast supplies are not inexhaustible.

Tosco's corporate plans and policies are based on these self-evident trends, and we are building our company on the firmly held premise that, after the nation has exhausted conservation and offshore drilling possibilities, development of new sources of domestic energy is inevitable.

It may be vital just to provide jobs. We now have a work force of 93 million Americans. There are some 2 million more young people coming into the work force every year than there are older people leaving. Manufacturing synthetic fuels provides more jobs than drilling or operating oil fields. And liquid and gaseous fuels are the life blood of our industrial and agricultural economy.

Every owner of a plant, home, or vehicle which requires liquid or gas fuel has a fixed capital investment which depends on the continued availability of fuels in these forms. The total national investment in oil and gas burning equipment is huge, and conversion to other forms of energy will be a long, costly, and uncertain process.

So, Tosco dedicates some five million dollars of its earnings from petroleum refining and marketing every year to the development of new source fuels from shale, coal, scrap tires, and other hydrocarbon sources. Of course, we do not expect an immediate return on that investment. No one can say when America will turn to its vast energy potential from unconventional sources; but, sooner or later, she will; and when it happens, we at Tosco expect to be prepared.

In the case of oil shale, there are vast deposits of recoverable semi-formed oil underlying huge acreages in the United States, Scotland, Russia, China, Morocco, Iran, Bulgaria, Thailand, Australia and other parts of the world. The richest shale deposits—possibly 600 billion barrels of recoverable oil—are in Colorado, Utah and Wyoming.

Years ago, Scotland produced shale oil commercially until the world became awash with cheaper petroleum. Russia and China have produced shale oil for decades and are expanding their installations. But in the United States, the largest and best shale deposits of all remain undeveloped. Fifteen to twenty major companies have excellent private oil shale properties totalling hundreds

of thousands of acres, but, three years after the 1973 Arab embargo, no company has begun construction of a commercial oil shale facility in the United States. The major reason, in my opinion, is that oil shale is plagued by popular misconceptions and boiling controversy.

The conventional wisdom is that commercial production is not yet economically or technologically feasible and has myriad environmental hazards. For example, the press carries repeated articles stating that oil shale production is terribly expensive, involves vast strip-mining, uses too much water, and might even cause cancer. This is hogwash.

First of all, the technology necessary for commercial shale oil production is available. The companies which have licensed our Tosco process and Union Oil Company, which has its own process, will confirm the availability of good first-generation technology. They know that America has the mining and retorting processes in hand to recover 100 percent of the hydrocarbon content of oil shale in commercial quantities.

It may not be the "Impossible Dream Technology," the yearned-for pure in situ process whereby a few miracle explosives placed deep in the shale deposits permit the oil to be extracted through a tube. Unfortunately, such a process is impossible today and, because of the nature of the rock, may remain so.

But we have a surface retorting process; and it works. It may be more comparable to the DC-3 than to the SST, but it gets all the oil out of all the shale. Although the Tosco technology has undergone the most extensive demonstration at the semi-works level of 1,000 tons per day, there are other promising technologies right behind us.

In the minds of many, the alleged environmental effects of commercial shale oil production are grossly misrepresented. We at Tosco chuckle at those who write about the massive strip-mining which oil shale production will entail. The truth is that some 93 percent of U.S. oil shale deposits are so far below the surface that strip-mining is unthinkable. The United States could produce more oil than exists in all of Arabia and never strip-mine an acre of shale.

Water requirements are also misrepresented. It takes about the same amount of water to produce a barrel of shale oil as it does to produce an equivalent amount of gas from a coal synfuel plant, and a shale oil plant requires substantially less water than a coal-fired power plant to produce an equivalent amount of energy. Furthermore, there are millions of acre feet of water contained in the shale deposits themselves which would be unlocked for productive use by commercial production of shale oil.

Water experts say that shale oil output could reach 2 million barrels per day before any water problem could emerge; and underground water and new techniques could probably take it beyond that.

We who work with the resource believe—and the Environmental Protection Agency agrees in large part—that the environmental effects of commercial shale oil production are manageable. We have invested heavily in environmental analysis and the development of control methods, and we believe the first commercial plant will lay to rest any doubts about the environmental compatibility of shale oil production.

So, why isn't America building oil shale plants? The answer is: For the same reason we are not building coal synfuel plants or nuclear or solar plants: Uncertainties.

The country is paralyzed by a series of unprecedented uncertainties. The general public is uncertain about the need for new energy sources. Some think we can squeeze the waste out of energy consumption and get by indefinitely. Others think delay will be catastrophic. Without public consensus, policy makers are stymied by conflicting pressures.

Private industry is uncertain about government policy—price controls and unrealistic environmental restrictions. Uncertainty over future rates of inflation, about future OPEC policies, and about capital availability and interest rates turn potential investors of risk capital away from pioneer energy ventures.

So, naturally when private industry doesn't build synfuel plants, the general public tends to conclude that synfuels are not yet economic or somebody would be doing it. Contrary to this popular misconception, our numbers indicate that, with proper financing, shale oil could be produced and marketed profitably in the U.S. today for around $12 per barrel[1]—a very competitive price compared with today's cost of foreign crude landed in U.S. ports ($13 plus and rising).

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[1] Our projections are based on the only detailed engineering design and cost estimates in existence for a commercial oil shale plant in the United States, which were obtained from the C. F. Braun Company at a private expense of $12 million.

The words "with proper financing" are critically important. Of the $12 selling price, about $5.50 is production costs. Capital service is $6.50 and could go as high as $12 to $15 per barrel, depending on how the project is financed. Shale oil plants are capital intensive, involving about $1 billion front end capital for a 50,000 b/p/d facility. If the facility is financed 25–30% equity and 70–75% long term debt, capital costs and, therefore, product prices are competitive. If there is more equity, and less debt, capital service will be higher and higher selling prices are required.

The reasons for this phenomenon are simple. Yields on equity are after-tax dollars to the project. Yields on debt are pre-tax dollars. The more equity, the higher the product price has to be to yield the same return to the investor. Thus it would make no sense—for the project, for the investor, or the consumer—to finance a synfuel plant with 100% equity.

Mr. Raymond Golden of Salomon Brothers told the Congress this year that tomorrow's energy projects—shale oil or coal gasification or nuclear—must be financed by project financing; and the debt/equity ratio should be two or three to one, because such financing means lower customer prices for the energy product. So, when newspaper articles put the costs of producing shale oil at $20 per barrel and synthetic gas at $6 per mcf, they should be ignored. Those numbers have to be based on hypothetical cases of 100% equity financing and are sheer fantasy. They could never happen.

Unfortunately, Mr. Golden's case of conventional project financing of a synfuel plant probably cannot happen today, either, because there is no commercial shale oil plant operating in the U.S. and lenders simply do not make conventional long-term loans to new unproved ventures of this magnitude until the technology and economics are demonstrated. So, we're in the "chicken and the egg situation"—no commercial demonstration without conventional loans and no conventional loans without commercial demonstration.

Certainly there are a few—very few—Triple A rated energy companies who could borrow the hundreds of millions of dollars necessary to build a synfuel plant by full resource pledges of their other assets; but to do so would tie a company's hands on other equally vital energy projects and encumber its financial flexibility, possibly to a point of jeopardizing its Triple A credit rating.

Big companies, like financial institutions, can take such huge risks only for investments of "impeccable quality." And a pioneer synthetic fuels plant using new technology producing domestic oil or gas in a political climate of price controls, allocations, environmental lawsuits and changing regulations is not exactly an investment of "impeccable quality." The bottom line is that private capital is not presently available for pioneer synthetic fuels plants.

Yet, the one fact that private industry is not moving into shale does not alter the big fact that domestic shale may well be an energy gold mine for the United States. It could be cheaper fuel than OPEC oil or liquefied gas from Algeria or Russia; it is certainly more reliable than foreign oil or gas; and there is a lot of it in Colorado, Utah and Wyoming.

We at Tosco believe that oil shale's time is near. The Moroccans have us studying their shale for commercial production. The Iranians want to study their shale. But the best shale in the world is in the United States. Tosco would like to participate in a joint venture to construct a 50,000 b/p/d facility in the U.S. with 8 or 10 companies investing $25 to $40 million each with long-term project debt of $700 to $800 million with each participant getting 10 to 12% of the oil (or oil and gas) for 25 to 30 years at—we believe—a lower price than oil or gas from the Arabs. And the oil supply would be embargo-proof.

In the past five years, our company has held serious discussions with more than fifty prospective project-financing sources—including possible equity participants (utilities; oil companies; auto, chemical and steel companies; farm co-ops; investment bankers; insurance companies; commercial banks). To each we have shown volumes of data on projected costs and revenues, inflation allowances, definitive designs and estimates. While no one can be absolutely certain about these figures for a first plant, the economics appear to be attractive. But thus far, everybody wants in on the second plant. Nobody wants to be first.

So, reluctantly, we turned to the United States Government in 1975. We told the Administration and the Congress that, in the national interest, someone should test the viability of America's vast oil shale deposits; and if private industry could not do it in the present climate, government should. The President's Energy Resources Council recommended to the Congress a synfuel commercialization program involving project loan guarantees. The Senate accepted it by a vote of 92 to 2. The House refused it by a vote of 263 to 140.

The Administration tried it again this year; and the House refused to consider it by a vote of 193 to 192.

As of now, a synfuels demonstration program financed by Government is buried in emotional controversy. Some Congressmen, responding to environmental groups who are opposed to any shale or coal facility anywhere under any conditions, vote *No* on every proposed synfuel program. Likewise, some conservative Congressmen who contend that government should remain aloof and someday, when the price is right, private industry will bring synthetics onstream in the normal course of economic events, also vote No. To date, this unnatural coalition has been able to block any government demonstration program for synthetic fuels.

Potentially, America has more oil in its domestic embargo-proof shale deposits than is known to exist today in all the Middle East. Good first generation technology is in hand. Preliminary economics appear to be positive. Environmental effects seem to be manageable. All that remains is for someone to build a plant and confirm the projections.

Meanwhile, the clock is ticking. The OPEC nations are expected to raise world oil prices again in 1977; Saudi Arabia may soon announce that they are limiting their oil production in the interest of conservation; and plant construction costs are still inflating. If it is true that America must eventually utilize its vast coal and oil shale resources for synthetic fuels, the sooner we begin . . . the better.

U.S. SENATE,
COMMITTEE ON INTERIOR AND INSULAR AFFAIRS,
Washington, D.C., June 2, 1976.

Mr. JACK O. HORTON,
Assistant Secretary for Land and Water Resources, Department of the Interior, Washington, D.C.

DEAR MR. SECRETARY: You will recall that since 1973 the members of this Committee have repeatedly urged the Department to lease Federal lands for in situ development of oil shale. The two Wyoming tracts which the Department originally indicated might be developed by *in situ* methods contained the smallest quantity of shale of the original six tracts. They were never leased. In April, 1975, the Department called for nominations for *in situ* leases.

The Department cited this proposal as the basis for its opposition to the *in situ* oil shale demonstration called for by Section 102 of S. 598 as agreed to by the Senate-House Conference Committee in December, 1975. The Department's opposition was a factor in the rejection of that provision by the House of Representatives.

In your December 2, 1975 letter to Senator Metcalf, you indicated that lease sales for two tracts were tentatively scheduled for "late summer of 1976". What are the sale dates? When will the environmental impact statement be released to the public?

We would appreciate your response as soon as possible.

Sincerely yours,

LEE METCALF,
Chairman, Subcommittee on Minerals, Materials and Fuels.
HENRY M. JACKSON,
Chairman.

JUNE 9, 1976.

Hon. HENRY M. JACKSON,
Chairman, Committee on Interior and Insular Affairs,
Washington, D.C.

DEAR MR. CHAIRMAN: This responds to your June 2 letter concerning *in situ* oil shale development.

As you know, the Department's prototype oil shale program envisioned six prototype lease tracts, two of which were to be developed by *in situ* or modified *in situ* technologies. After no bids were received for the two Wyoming *in situ* tracts and after a recommendation from the Department's Oil Shale Environmental Advisory Panel (OSFAP), it was decided to select up to two additional in situ tracts for development under the prototype program.

As noted in your letter, the Department published a call for nominations of lease areas in April, 1975. Subsequent to the July 31 closing date for the nominations, as intergovernmental committee was formed to make preliminary tract

recommendations. Last September this committee, which included State government representatives, submitted its report to me. After receiving additional recommendations from the Oil Shale Environmental Advisory Panel in November of 1975 a decision was made to prepare a draft supplemental environmental impact statement on four of the nominated tracts. From these four tracts, two would be selected for possible leasing and development by *in situ* technology.

The supplemental environmental impact statement is currently being prepared, its release date is uncertain at this time. Depending on the completion date of the final supplemental environmental impact statement, the actual lease sales will most likely occur sometime in calendar year 1977.

Sincerely yours,

CHRIS FARRAND,
Deputy Assistant Secretary of the Interior.

SENATE INTERIOR COMMITTEE,
MINERALS, MATERIALS AND FUELS,
Washington, D.C., July 19, 1976.

Hon. JACK O. HORTON,
Assistant Secretary for Land and Water Resources,
Department of the Interior,
Washington, D.C.

DEAR MR. SECRETARY. We understand that the lessees on the two oil shale leases in Colorado have requested permission to suspend development activity. If granted, the suspension would permit the lessees to continue to hold each lease without making the installment payments due on their bonus bid.

We would appreciate a full report on the reasons for the request for suspension and an indication of whether the Department intends to approve the requests. Also, what would be the justification for any such approval.

Thank you very much for your cooperation.

Sincerely yours,

HENRY M. JACKSON,
Chairman.

LEE METCALF,
Chairman, Subcommittee on Minerals, Materials and Fuels.

U.S. DEPARTMENT OF THE INTERIOR,
OFFICE OF THE SECRETARY,
Washington, D.C., August 20, 1976.

Hon. LEE METCALF,
Chairman, Subcommittee on Minerals, Materials and Fuel,
Washington, D.C.

DEAR SENATOR METCALF: This responds to the letter of July 19 from you and Chairman Jackson concerning suspension of the prototype oil shale leases.

You are correct in your understanding that the two oil shale lessees in Colorado filed applications for less suspension pursuant to Section 39 of the Mineral Leasing Act. Enclosed are copies of the suspension requests which were filed on March 3 by C–b lessees, Shell Oil Company and Ashland Oil, Inc., and on July 2 by C–a lessees, Standard Oil Company and Gulf Oil Corporation. Lessees for the two Utah tracts have also requested suspension.

The Department has revised these requests and has carefully considered its authority for suspending leases under the Mineral Leasing Act (30 U.S.C. 209) and Sections 1(d) and 22 of the oil shale lease. We have concluded that a request for suspension of operations may be granted if the Secretary of the Interior finds that a suspension would be in the interest of conservation of natural resources. The term "conservation of resources" has been defined broadly by the Department to include conservation of environmental resources as well as mineral resources.

In reviewing the lessees' reasons for requesting lease suspensions, several important issues have been carefully considered.

During the oil shale lessees' environmental baseline data program it was discovered that for intermittent periods natural background levels of nonmethane hydrocarbons, certain oxidants, and particulates exceeded Federal clean air

standards. Since there are no major point sources in the area, it appears that natural phenomena may be the source of some of these pollutants. However, because the air quality standards are already exceeded, it is unclear whether actual development of the lease tracts can proceed.

The Department has brought this matter to the attention of the Environmental Protection Agency. EPA has indicated that technical studies currently underway as well as amendments to the Clean Air Act may provide a basis for resolving the air quality question. However, until these occur it may not be possible to determine whether the lessees will be able to comply with existing and future air quality standards.

The second matter which the Department must consider involves the recovery of the mineral resources on tract C–a. As you know, at the time of the lease sales the Department believed that it had the authority to allow certain offsite land uses related to oil shale development. That interpretation was subsequently found to be incorrect. Since then we have been supporting legislation, S. 2413 and H.R. 11165, to solve this problem. Under the lessee's proposed plan of operation for tract C–a, the utilization of appropriate off-tract disposal sites for spent shale and overburden will increase the overall rate of recovery from an estimated 16 percent to 65 percent of the oil shale reserves in the tract. Hence the outcome of the pending legislation has a significant bearing on the recovery and the conservation of the resource.

We have also evaluated the material submitted by the C–b lessees and have concluded that rock strength beneath tract C–b is lower than in other areas where underground mining of oil shale has been demonstrated. This situation can greatly affect ultimate resources recovery. Additional studies are needed so that the mine design can provide for maximum resources recovery.

In view the the above considerations, I have decided that it is in the public interest to suspend for one year the Colorado oil shale leases until these issues have been resolved or until it is clear that no solution will occur.

However, this suspension does not relieve the lessee from its obligation to make bonus installment payments after the suspension is lifted. Moreover, we will require that environmental monitoring by the lessees be continued throughout the period of suspension.

No decision on the question of suspension of the two Utah leases has been reached.

Although the Department remains committeed to the goal of demonstration of commercial scale oil shale production and environmental control technology, a suspension of operations at the present time is in the interest of the conservation of both mineral and environmental resources.

The Department will continue to seek solutions to these questions and will provide whatever assistance is necessary to help resolve those issues requiring a legislative solution.

Sincerely yours,

H. Gregory Austin,
Acting Secretary of the Interior.

Enclosures.

Senate Interior Committee,
Subcommittee on Minerals, Materials and Fuels,
Washington, D.C., December 7, 1976.

Mr. Russell Train,
Administrator, Environmental Protection Agency,
Washington, D.C.

Dear Mr. Train: On November 30 the Subcommittee held an oversight hearing on the future of oil shale development. At the hearing, representatives of the Department of the Interior pointed out that one of the principal reasons for the Department's suspension of operations on all four of the outstanding oil shale leases was the fact that the national primary and secondary air quality standards are, on an occasion, exceeded on the undeveloped tracts.

The Department indicated that this situation has been discussed with EPA "which is currently studying a means for defining geographical areas for oxidant control strategy." What is the current status of these studies? When does EPA expect to determine whether this situation can be resolved administratively or whether legislation is necessary?

It appears likely that the costs of preventing or minimizing air and water pollution may be a substantial impediment to oil shale development. Has EPA done any analyses of this subject? If so, I would appreciate having them.

I would appreciate your responses by December 20 so that they can be included in the official record of the hearing. Thank you very much for your cooperation.

Very truly yours,

LEE METCALF, *Chairman.*

U.S. ENVIRONMENTAL PROTECTION AGENCY,
Washington, January 4, 1977.

Hon. LEE METCALF,
Chairman, Subcommittee on Minerals, Materials and Fuels, Committee on Interior and Insular Affairs, U.S. Senate, Washington, D.C.

DEAR MR. CHAIRMAN: This is in response to your letter of December 7, 1976 which requests information dealing with a "means of defining geographical areas for oxidant control strategy" as it applies to oil shale development as well as general information concerning ongoing oil shale programs within the Environmental Protection Agency (EPA).

Enclosed for your information is a document signed by me on December 15, 1976 which addresses this subject, particularly the section beginning on Page 6 entitled "Geographic Applicability of Emission Offset Requirements for Hydrocarbon Sources." As you can see from this document, it is proposed that hydrocarbon sources in rural areas, such as oil shale development in the West, be considered in the context of the national photochemical oxidant problem.

The Office of Research and Development within EPA has an active oil shale program involving local and regional environmental assessments, monitoring of surface and groundwater, methods to predict water pollution from mining activities and methods to reclaim spent shale. Enclosed also is a recently completed study of potential environmental concerns associated with oil shale entitled "A Preliminary Assessment of Environmental Impacts From Oil Shale Developments." Additionally, we are in the process of completing an agreement with the Energy Research and Development Administration's Laramie Laboratory to conduct cooperative programs as the technology for oil shale development proceeds.

I hope the above provides the information you need and if my office can be of further assistance, please contact me.

Sincerely yours,

Enclosures.

JOHN QUAILES, *Deputy.*
RUSSELL E. TRAIN, *Administrator.*

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 51]

REVIEW OF NEW SOURCES AND MODIFICATIONS—ADVANCE NOTICE OF PROPOSED RULEMAKING

The Environmental Protection Agency intends to amend 40 CFR Part 51 (Requirements for Preparation, Adoption and Submittal of Implementation Plans) to modify and clarify the requirements for preconstruction review of new or modified air pollution sources 40 CFR 51.18). The current version of 40 CFR 51.18 requires that each State Implementation Plan (SIP) under the Clean Air Act contain a regulation requiring preconstruction review and disapproval of all new or modified air pollution sources which would "interfere with" the attainment or maintenance of a national ambient air quality standard (NAAQS).

The tentative proposals outlined below are closely related to the Interpretative Ruling published elsewhere in today's Federal Register (at 41 FR ——). The ruling provides in general that, under 40 CFR 51.18, a major new source may locate in an area violating a NAAQS only if stringent conditions can be met. These conditions are designed to insure that the new source's emissions will be controlled to the greatest degree possible; that more than equivalent offsetting emission reductions will be obtained from existing sources; and that there will be progress toward achievement of the NAAQS. (The conditions of the ruling are hereinafter collectively referred to as the "emission offset requirements.")

Interested persons are invited to participate in the development of the proposed rules by submitting written comments on the points raised in this notice (preferably in triplicate) to: Environmental Protection Agency, Control Programs Development Division (MD–15), Research Triangle Park, N.C. 27711. Persons commenting on this advance notice are also encouraged to comment on the basic policies and detailed provisions of the above-referenced Interpretative Ruling, and to prepare a single set of comments addressing both this notice and the ruling. All comments received on or before February 15, 1977, will be considered as EPA develops proposed modifications or clarifications. All comments submitted will be available for public inspection at EPA's Public Information Reference Unit, 401 M Street, S.W., Washington, D.C. 20460.

Definition of "major" source and effect of definition

EPA is contemplating a modification to 40 CFR 51.18 which would provide States with more explicit guidance on how they may focus their preconstruction review program resources on sources which have the greatest impact on air quality. The contemplated change would allow States to establish a two-level system for reviewing new sources. The complexity of the review would depend on the size of the proposed source.

States have always been allowed to exempt insignificant sources from review altogether, although firm national guidance has not been provided as to what constitutes an insignificant source. To remedy this, EPA proposed on July 8, 1975 (40 FR 28629) a list of such insignificant sources. Further action on this proposal has been deferred pending the more comprehensive amendments to Section 51.18 outlined in this notice. Any additional comments on the July 8, 1975, proposal are solicited; comments previously submitted have been retained for consideration and need not be resubmitted.

Once the sources exempt from review altogether have been defined, the contemplated changes to Section 51.18 would allow the remaining sources to be separated into two categories for review purposes. Those sources defined as "major" sources would be subject to an air quality analysis, and if found to exacerbate a violation of a NAAQS, would be subject to the emission offset requirements discussed above. In addition, only major sources would be subject to the public comment requirements set forth in 40 CFR 51.18.

Smaller sources would be reviewed to ensure compliance with applicable SIP emission limitations but would not be subject to the air quality analysis, public comment, and emission offset requirements. Another option would be to require the use of the lowest achievable emission rate (as defined in Part IV.A.1 of the ruling) for these smaller sources if they would be located in an area that exceeds a NAAQS.

Comments on the over-all approach outlined above are solicited, including an appropriate definition of "major" source. Of particular interest to the Agency are comments on the resource requirements related to any recommended definition of major source (i.e., number and kinds of sources subject to the emission offset requirements, man-hours required per review, etc.), and the percent of total new emissions which would be emitted by major sources under the recommended definition. To provide a basis for comment, the following tentative definition is offered:

"Major source" shall, as a minimum, cover any structure, building, facility, installation or operation (or combination thereof) for which the allowable emission rate is equal to or greater than the following:

	Tons per year
Particulate matter	50
Sulfur oxides	50
Nitrogen oxides	50
Non-methane hydrocarbons (organics)	50
Carbon monoxide	500

Similarly a "major modification" shall include a modification to any structure, building, facility, installation or operation (or combination thereof) which increases the allowable emission rate by the amounts set forth above. A proposed new source with an allowable emission rate exceeding the above amounts is considered a major source, even though such a source may replace an existing source with the result that the net additional emissions are increased by less than the above amounts.

Where a source is constructed or modified in increments which individually do not meet the above criteria, and which are not a part of a program of construc-

tion or modification in planned incremental phases previously approved by the reviewing authority, all such increments shall be added together for determining applicability under this definition. Moreover, where there is a group of proposed sources which individually do not meet the above criteria, but which would be constructed in substitution for a major source, the group should be collectively reviewed as a major source.

Allowable annual emissions shall be based on the applicable New Source Performance Standard (NSPS) set forth in 40 CFR Part 60 or the applicable SIP emission limitation, whichever is less, and the maximum annual rated capacity of the source. If the source is not subject to either a NSPS or SIP emission limitation, annual emissions shall be based on (1) the maximum annual rated capacity, and (2) the emission rate agreed to by the source as a permit condition.

The following shall not, by themselves, be considered modifications:

(1) Maintenance, repair, and replacement which the reviewing authority determines to be routine for a source category.

(2) An increase in the hours of operation, unless limited by previous permit conditions.

(3) Use of an alternative fuel or raw material, if the source is designed to accommodate such alternative use (unless limited by previous permit conditions).[1]

(4) Change in ownership of a stationary source.

Regardless of how "major source" is defined in a nationwide context, the applicability of the emission offset requirements may need to be extended to smaller sources in certain areas, depending on the magnitude of the air quality problem, growth rate and source mix, resources and technical expertise available to the reviewing authority, etc. Comments on whether more comprehensive reviews should be required in certain areas and the specific criteria for selecting these areas are also requested.

It should be noted that the above proposals relate only to reviews under 40 CFR 51.18; EPA is not in this notice suggesting the need for changes to its regulations for prevention of significant deterioration (40 CFR 52.21), new source performance standards (40 CFR part 60), or hazardous emission standards (40 CFR part 61). These regulations are already sufficiently precise as to their scope of coverage.

Geographic applicability of emission offset requirements for hydrocarbon sources

Because widespread violations of the NAAQS for photochemical oxidants have been found even in remote rural areas, some has assumed that hydrocarbon[2] control programs (including emission offset requirements) are necessary in all areas where there are violations of the photochemical oxidant NAAQS. Since photochemical oxidants or their precursors can be transported long distances, the focus for regulatory action must be on areas where the precursors and photochemical oxidants originate, not on areas where the photochemical oxidant levels are measured. In addition, it appears that in areas where there are considerably more hydrocarbons present than nitrogen oxides (high ratio of hydrocarbon-to-nitrogen oxides), changes in the levels of hydrocarbons present may result in relatively insignificant changes in the level of photochemical oxidants locally produced. Generally, such areas are found where the local emissions of nitrogen oxides are small, such as in rural areas.

The above findings, along with other studies, present convincing evidence that most of the rural photochemical oxidant problem results from the transport of both photochemical oxidant and its precursors from urbanized areas. Therefore, the photochemical oxidant reduction benefits to be gained from implementing the emission offset requirements for hydrocarbon sources locating in rural areas may be insignificant when compared to the benefits of focusing on the urbanized areas where most of the rural area problem originates.

In urban areas, the ratio of hydrocarbons-to-nitrogen oxides tend to be low so that changes in levels of photochemical oxidants locally generated are quite sensitive to changes in the levels of hydrocarbon present. Thus, hydrocarbon emission control programs (including the emission offset requirements) would

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[1] Preliminary comment indicates that although this exemption is already codified in general EPA regulations regarding modifications (40 CFR 52.01(d)(2)(iii)), it should not apply in areas which are in violation of a NAAQS. The argument is that the exemption would allow major pollution increases in non-attainment areas to go unchecked. The Administrator agrees that this is a problem that should be reviewed and specifically invites comments on the issue.

[2] Hydrocarbons are precursors to photochemical oxidants.

be expected to be effective in reducing the amount of photochemical oxidants locally generated in the urban area, thus also reducing the amount transported to neighboring rural areas.

An investigation is underway to determine the extent of the geographical area around urbanized locations where hydrocarbon emission control programs will be most effective in reducing photochemical oxidant levels. Early findings of this investigation indicate that these areas may be proportional to city size and may extend up to 85 miles from major metropolitan areas. In addition, upwind-downwind measurements around smaller urban areas and isolated point sources of hydrocarbons and nitrogen oxides indicate that there is little if any increase in observed photochemical oxidant concentrations as a result of the emissions from such smaller urban areas and isolated point sources. Although very limited data are available, it appears that urban areas with a population less than 200,000 produce little, if any, measurable increase in photochemical oxidant levels.

If these findings are confirmed, the policy evolving from such data might indicate that only major hydrocarbon sources locating within a specified distance of urban areas larger than 200,000 population would be subject to the emission offset requirements. Sources providing the offset would have to be located within the same specified area.

Comments on this and other possible criteria for determining the geographic applicability of the emission offset requirements for hydrocarbon sources are solicited. Comments are particularly desired on the need for obtaining emission offsets in remote rural areas that are, in most cases, exceeding the photochemical oxidant NAAQS and on the availability of emission offsets in such areas.

A preliminary draft of a report has been prepared which sets forth in more detail the basis for the tentative conclusions outlined above. This draft has been reviewed for its technical content by a limited number of scientific experts outside the Agency. Comments have been receive and the report is being revised based on these comments. The revised report will be made available shortly for public inspection at EPA's Public Information Reference Unit, 401 M Street, S.W., Washington, D.C. 20460. A notice of availability will be published in the Federal Register. Persons preparing comments on this notice may wish to refer to the report and comment on it.

"Fugitive dust" issues

There has been considerable concern about the location of major stationary sources of particulate mater in NAAQS non-attainment areas where fugitive dust has been determined to be the major cause of non-attainment. This concern has lead to several questions regarding the impact of fugitive dust sources (i.e., traffic on unpaved roads, construction, farming) upon existing air quality levels in both urban and rural areas.[3] This is due in part to the particle size distribution within fugitive dust areas.

While data are relatively limited, they indicate that within fugitive dust areas a large portion of the total suspended particulate (TSP) collected upon the hi-volume air sampler is comprised of larger sized particles. In addition, there is a preponderance of larger sized particles associated with these fugitive dust sources. There is some question as to whether these larger sized particles by themselves cause any significant health or welfare related problems since both health and welfare critera (especially visibility) are closely related to smaller sized particulate material.

The Agency currently believes that the fugitive dust problem within urban areas is more critical and should receive higher attention than similar type problems within rural areas. This lower priority of rural areas is based upon the belief that the toxic fraction of fugitive dust in areas without the impact of man-made pollutants is likely to be small. Fugitive dust sources in such areas include dust from deserts, arid lands, sparsely vegetated land, exposed but vacant lots in rural communities, dust from sparsely traveled unpaved roads and unpaved residential driveways, and other such conditions common in rural America. Fugitive dust in these areas is typically native soil that for various reasons becomes airborne. It is generally not exposed to potential contamination of industrial fallout or subject to adsorption of gaseous pollutants, which commonly occur in urban atmospheres. This analysis is supported by the belief that in rural areas relatively free from point emission sources, such as many areas

[3] The term "fugitive dust" should be distinguished from the term "fugitive emissions." The latter term generally refers to industrial process emissions which do not pass through a stack or chimney.

of the Southwest, the TSP may be composed largely of non-toxic substances, such as silicates; although certain organic material, such as fungi and aeroallergenes, may be present in specific areas.

No epidemiological studies have been conducted in sparsley populated areas where the TSP concentration may be high due to fugitive dust. In general, the population is too small to provide a statistically significant sample. Detailed information on the chemical composition of the TSP in these areas is not available; however, the toxic fraction is likely to be small.

Fugitive dust in urban areas, on the other hand, is a relatively different phenomenon. While mineral matter is still the primary ingredient, it can no longer be considered as native soil. In urban areas, it is contaminated to a measurable degree by various components highly suspect in health impairment. Urban fugitive dust contains fallout from industrial and combustion related processes, lead from automotive exhaust, measurable rubber tire particles, and other components associated with an advanced technologically-dependent community. Further contamination may result in urban areas from adsorption of harmful gases or adhesion of urban fine particulate matter on fugitive dust particles, making fugitive dust particles carriers of potentially more harmful and potent ingredients. In summary, while there is a need to be concerned with some aspects of the native dust problem itself within urban areas, the major concern is the potential for that native dust to be contaminated by more harmful substances than the dust itself, thereby causing the fugitive dust sources to contribute significanly to the level of harmful particulates found within urban areas.

The Agency is therefore considering a new source review policy which would recognize the differences between fugitive dust in urban and rural areas. Consequently, for new sources of particulate matter proposing to construct in rural areas that exceeding the TSP NAAQS, it is contemplated that they be allowed to construct without being subject to the emission offset requirements so long as they meet new source performance standards (NSPS) set forth in 40 CFR Part 60 or best available control technology, if no NSPS is applicable, and so long as their own emissions, plus consideration of "non-urban background" [4] and emissions from other stationary sources in the vicinity of the proposed location, do not cause violations of the NAAQS.

For new source review in NAAQS non-attainment urban areas, the emission offset requirements would be applicable. Since fugtive dust is recognized as a legitimate air pollution problem in urban areas, it would seem appropriate to allow emission offset credit to come from existing fugitive emission sources.

Comments on all aspects of the tentative approach outlined above are solicited. Comments are specifically solicited on the definition of "urban" and "rural" areas, on the issue of how large new sources of fugitive dust (i.e., strip mines, tailings operations) are to be considered when locating in rural areas, and whether (and to what extent) emission offsets of conventional stack emissions against fugitive dust-type sources should be permitted.

This advance notice of proposed rulemaking is issued under the authority of sections 110 and 301 of the Clean Air Act, as amended (42 U.S.C. 1857c–5 and g.)

RUSSELL E. TRAIN,
Administrator.

Dated December 15, 1976.

[4] Usually based upon the lowest measured annual average TSP air quality concentration in the broad area where the new source will be located, approximately 30 ug/m^3.

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